PUBLIC WORKS

city county and state

July 1949

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some of the articles in this issue:

Complete Sewage Treatment for a School

•

Small Community Traffic Planning Survey

•

Building a Reservoir by Force Account

•

Diagnosing Pavement Maintenance Needs

•

Repairing a Sewer with Gunite

★ ★ ★

Complete Contents Listed on Page 5

LEADER IN THE PUBLIC WORKS FIELD

William J. Orchard

"Bill" Orchard of Wallace & Tiernan to thousands; outstanding in the field of sanitary engineering; widely known and honored for his many contributions; possessor of titles and honors too numerous to mention here; recipient for war-time services of the Roosevelt Medal and of the Medal for Merit, the highest civilian award of the country; and long an acknowledged leader in the field.

Roadside Report

FORD Bonus Built TRUCKS ★ **M. W. LOGAN**
Miami, Florida

Ford Model F-7 BIG JOB shown, has Gross Vehicle Weight rating of 19,000 lbs.; Gross Combination Weight rating of 35,000 lbs. as a tractor.

"My 145-h.p. FORD F-7 Makes Two Extra Loads Per Day!"

"HAULING wet sand and pit rock, I find that my 145-horsepower Ford F-7 Big Job can get in two extra loads a day over trucks of other makes," writes Murray W. Logan of Miami, Florida. "We're getting 50 to 55 miles an hour in high gear—and exceptional pulling power in low speeds. Gas mileage comes to 7 miles per gallon, and maintenance costs have been nominal. In my opinion, no 2½ ton truck of any other manufacturer compares with the Ford F-7!"

Dump-truck operators like Mr. Logan are going all-out in their praises for the new 145-h.p. Ford Big Jobs. For one thing . . . the new Ford 337 cu. in. engine outperforms anything in its class. For another . . . there's the luxurious comfort of the new Ford Million Dollar Cab—mighty important in work on rough roads or off-the-road construction. And Ford Big Jobs are Bonus Built—a feature of every one of over 150 Ford Truck models. Bonus Built is the superstrong construction that contributes to long truck life. Life insurance experts prove Ford Trucks last longer.

ONLY THE FORD BIG JOB
HAS ALL THESE FEATURES

- ★ New 145-h.p. Ford V-8 engine for top performance.
- ★ Ford exclusive concentric dual-throat carburetor for more power, more economy.
- ★ New heavy duty 5-speed transmissions—overdrive or direct-in-fifth—for operating flexibility.
- ★ Big Ford power-operated hydraulic brakes; front 16-inch by 2¼-inch; rear 15-inch by 5-inch double cylinder on F-7, 16-inch by 5-inch double cylinder on F-8. Air brakes also available for F-8.
- ★ Ford Super Quadrax single speed axles; two-speed axle available in Model F-8.
- ★ Large diameter (10-inch) wheel bolt circle with 8 studs to allow for extra-strong hub construction.
- ★ Million Dollar Cab with Ford Level Action suspension for greater driving comfort.
- ★ Nationwide service from over 6,400 Ford Dealers.
- ★ Ford Bonus Built construction for long truck life.

Gross Vehicle Weight ratings: F-8 up to 21,500 lbs., F-7 up to 19,000 lbs. Gross Combination ratings: F-8 up to 39,000 lbs., F-7 up to 35,000 lbs.

FORD 1949 Bonus Built TRUCKS 1959

BUILT STRONGER TO LAST LONGER

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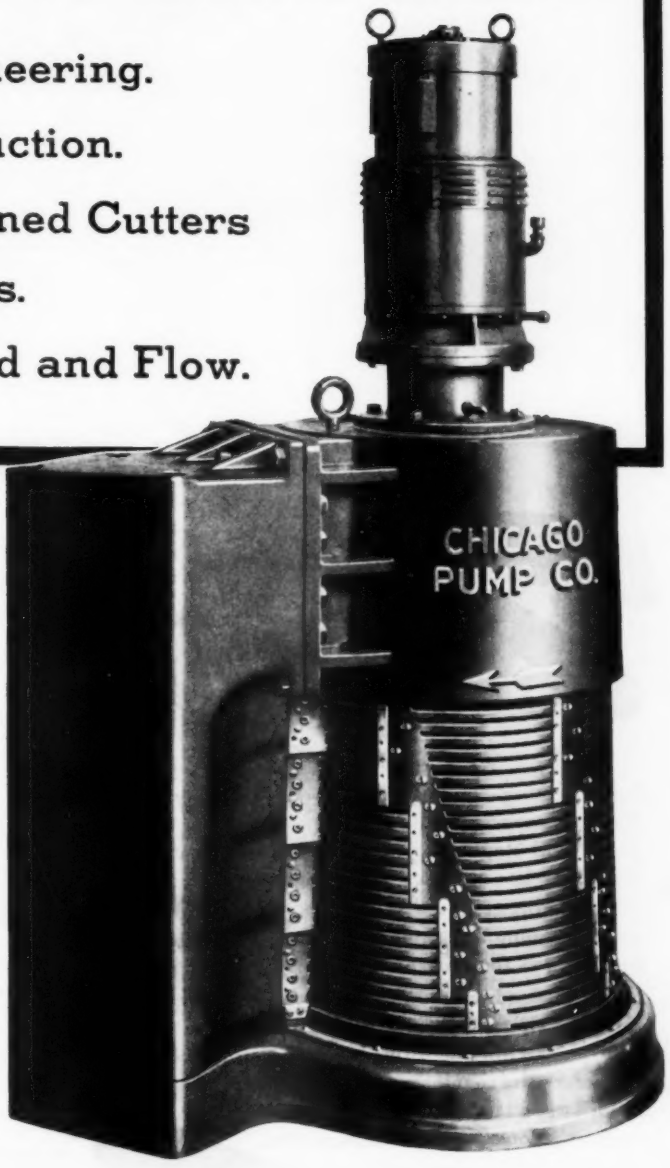

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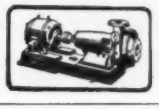

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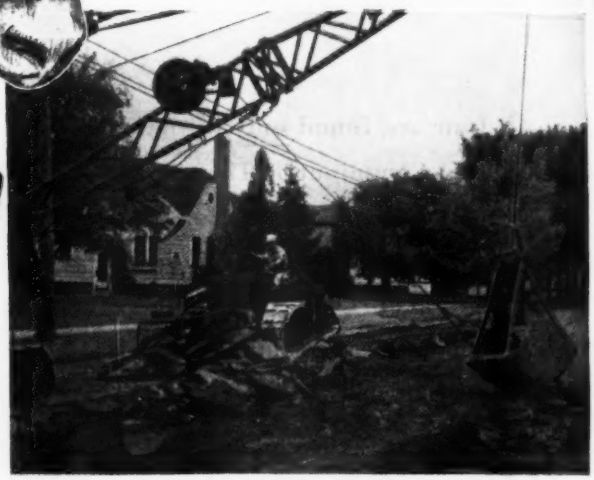
JULY, 1949

RAM

Breaking blacktop—for a clamshell to remove—is just one of the many jobs this versatile International Diesel does to speed street repair and re-paving. A year-'round workhorse, this TD-9 more than pays its way in the community.



Land clearing—or any 'dozer work—is a pushover for International Diesel Crawlers. They have the power and stamina to ram jobs through to completion at low cost and in minimum time.

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PUBLIC WORKS

THE ENGINEERING AUTHORITY IN THE CITY-COUNTY FIELD

Edited by
W. A. HARDENBERGH and A. PRESCOTT FOLWELL

CONTENTS FOR JULY, 1949

Temporary Complete Sewage Treatment for a School. *By R. T. Richey* ... 19
What Houston Did to Protect Its Water Supply ... 21
A Simple Method for a Small Community Basic Traffic Planning Survey. *By William S. Bonner* ... 22
Diesel Power Pays Dividends. *By T. J. Malone* ... 25
Proper Diagnosis—the Key to Pavement Maintenance. *By J. E. Lawrence and R. T. Pyne* ... 26
Personal Experiences in Biofilter Plant Operation. *By John Lawrence and Harry Eichenauer* ... 29
Gunite Saves Money on Sewer Repair. *By D. D. Hankins* ... 30
Methods of Subgrade Treatment and Drainage. *By H. A. Sullivan* ... 32
How We Built a Reservoir by Force Account. *By Peter G. Perla* ... 33
Court Rules on Award of Patented Article ... 38

PUBLIC WORKS DIGESTS

The Water Works Digest ... 42
The Highway and Airport Digest ... 48
The Sewerage and Refuse Digest ... 52

PUBLIC WORKS ENGINEERING DATA

Recording Chlorine Residuals ... 38
Man-Hours of Labor for Mosquito Control Operations ... 40
Experiences with Reflectorized Traffic Paint ... 40
Ascertaining Underground Conditions in Planning Sewers ... 41
Costs of Repairing Pipe Breaks ... 41
Presenting Municipal Financial Data ... 41
Sewer Maintenance in San Francisco ... 46
Costs of Installing and Repairing Meters ... 50

DEPARTMENTS AND SECTIONS

Leaders in Public Works ... Front Cover
Editor's Page ... 7
Letters to the Editor ... 12
Books of the Month ... 13
Consulting Engineers ... 58
New Equipment ... 60
The Engineers' Library ... 65
Worth Telling ... 70

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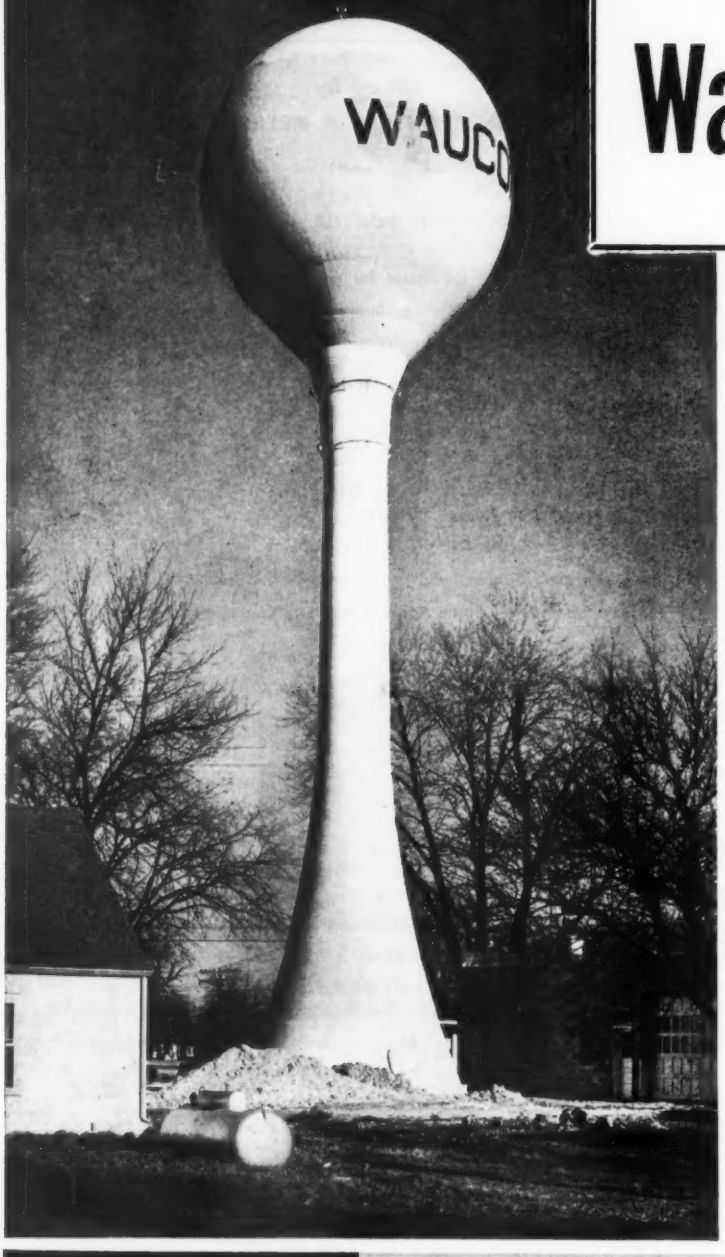
Watersphere



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Detroit 26	1536 Lafayette Bldg.	Seattle 1	1339 Henry Bldg.
Houston 2	2142 National Standard Bldg.	Tulsa 3	1641 Hunt Bldg.

The EDITOR'S PAGE

Retirement Provision Values for Municipal Employees

The value of retirement systems for municipal employees is becoming more fully appreciated by governing officials. Not only does it help to attract to public service capable employees but it tends to hold them in competition with higher paid private employment. There were many instances where retirement was the major, if not the sole factor, in influencing the return of valued employees after war-time service. Moreover, the actual savings from a retirement plan may pay much or all of its cost.

The usual retirement plan provides for old age retirement, disability and death. For this, a minimum of about 300 employees is required for proper operation. For retirement only, as few as 50 participants may be sufficient. Even under such conditions, the small municipality may find it impossible or difficult to establish a suitable system at reasonable cost, relying wholly on its own resources. Some 29 states now have a statewide retirement system to which all municipalities within the state may subscribe by voluntary action. In the states where such plans are not in effect, the only other recourse for the small municipality is a group retirement income contract with an insurance company. Whatever the means that are necessary, and within the limits of sound business principles, all municipalities ought to take immediate steps to establish some sort of retirement system for their employees. It is good business.

For Better Municipal Engineering

The problems of municipal and county engineering are manifold, and require for their solution a sound engineering knowledge, management ability, a background of experience, and the utilization of modern labor-saving equipment. The last-mentioned item has become increasingly important as the costs of doing work by hand have risen by leaps and bounds; but the other requirements have not lessened in importance.

Many of these problems of municipal engineering are not covered in engineering textbooks and perhaps not fully in engineering journals. Competence to solve them must therefore come from learning at first hand from others. Fortunately this is possible. The American Public Works Association, which is a direct descendant of an earlier engineering society of great worth, the American Society for Municipal Improvements, provides in its unique and valuable sessions an appropriate opportunity. It has developed series of panel discussions at its annual conventions, where the municipal engineer can learn directly from others of their experiences in solving the varied engineering problems that confront municipalities. The APWA is one of the shining examples of the values that can be derived from a well-planned, down-to-earth engineering convention.

Our other engineering societies are doing a good job, and in many cases a fine job in their individual fields, as illustrated, for instance, by the recent AWWA convention in Chicago. More engineers should take active parts in such societies. It is an obligation to their profession and it is also the best paying proposition we know of. We have spoken previously in these pages of the necessity for engineering leadership and coherence of engineering aims, if our profession is to progress. These can be obtained best, if not solely, by participation in and action through the several engineering societies.

Sanitation Is an Essential for Every Community

"Sanitation is a way of life. It is the quality of living that is expressed in the clean home, the clean farm, the clean business and industry, the clean neighborhood, the clean community. Being a way of life, it must come from within the people; it is nourished by knowledge and grows as an ideal in human relations."

The quotation is from the National Sanitation Foundation. It is especially applicable to everyday life in our cities, and the technical and elected officials of the community have a very large responsibility for its creation. This they can do through better equipment and practices for street cleaning; through garbage collection with modern collection units and disposal by established sanitary means; through the provision of sewers for all homes and adequate sewage treatment for the entire community; and through good municipal housekeeping.

There is plenty of room for leadership in this essential field of public administration and management.

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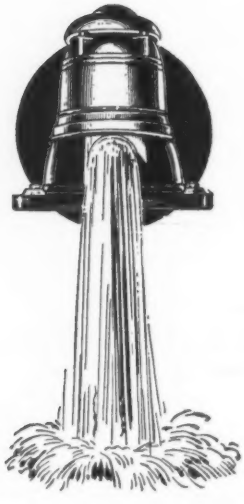

Small cities receive the same professional engineering, skillful workmanship and high quality equipment which is always provided for the largest cities. The only difference is in the size and capacity of the units installed. Many hundreds of small cities and villages already have their own Layne Well Water Systems. All are highly pleased with their sound investments; the economy of operation cost and the complete dependability of the units at all times. The owning of a modern, high efficiency well water system has enabled many to obtain new industries and at the same time to enjoy better fire and health protection.

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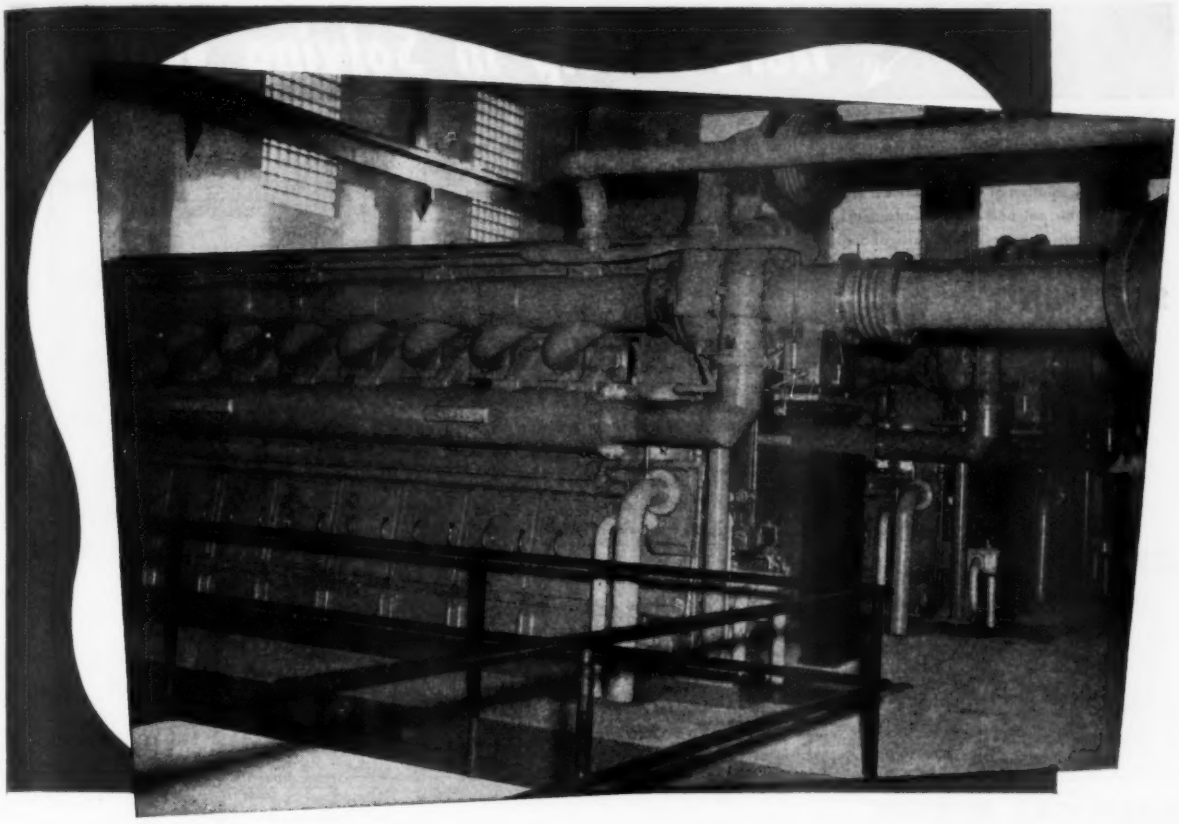

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SLUDGE and GREASE COLLECTION

9. **STRAIGHTLINE SLUDGE COLLECTORS** — for rectangular settling tanks, Straightline Collectors with peak-cap bearings, pivoted flights and "Straightline" action provide a combination which can't be beat for efficient collection of sludge and grease. Send for Book No. 1742.
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SLUDGE DIGESTION

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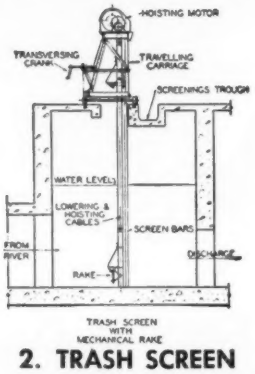
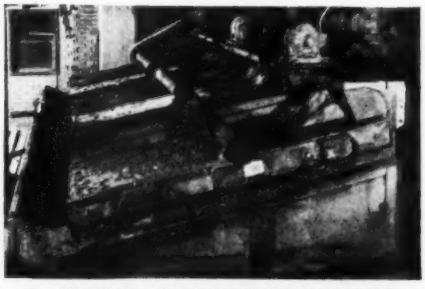


2. TRASH SCREEN



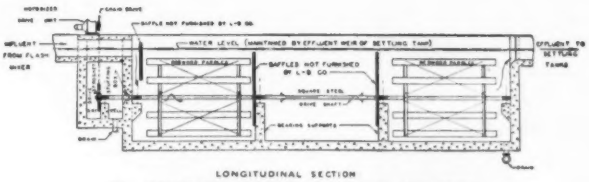
3. LIQUID VIBRATING SCREENS

4. STRAIGHTLINE GRIT COLLECTOR

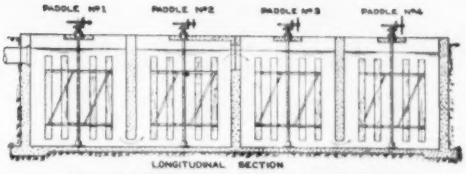
Sewage and Industrial Liquids Problems

5. TRITOR SCREEN

6. FLASH MIXER

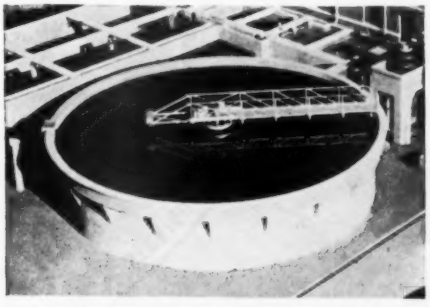


7. HORIZONTAL SLOW MIXER

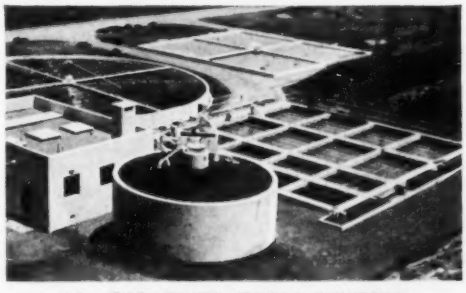


8. VERTICAL SLOW MIXERS

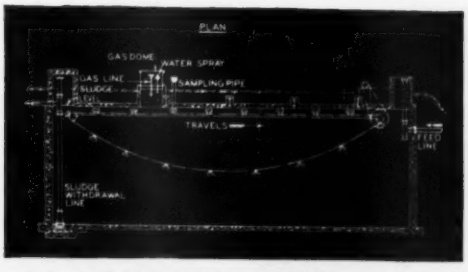
9. STRAIGHTLINE SLUDGE COLLECTORS



10. CIRCULINE SLUDGE COLLECTOR



11. BIO-FILTRATION SYSTEM



12. STRAIGHTLINE SCUM BREAKER

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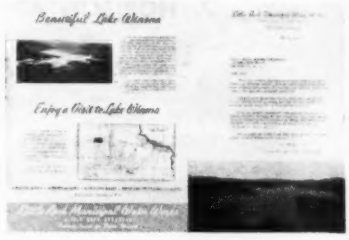
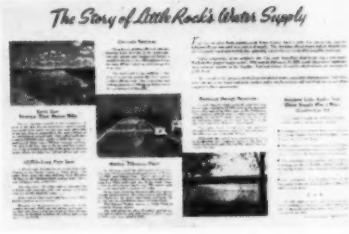
L. A. Jackson,
Manager-Engineer,
Municipal Water Works,
Little Rock, Arkansas.

(Ed. Note: We are always glad to have information such as this, and we want to congratulate Mr. Jackson and the Board of Water Works Commissioners on a fine job. The illustrations herewith may give some idea of the attractive letterhead used.)





THE CHEMISTRY ARTICLE:

I have just finished reading in the May PUBLIC WORKS the excellent article "Water and Sewage Chemistry and Chemicals." How can I obtain the article "Operation of Water Treatment Plants" published in your April, 1948, issue? Such practical and comprehensive articles are rare indeed.

Edward Griner.

(Ed Note: This is typical of many letters on this subject, and the following information will answer the questions in most of them:

We can supply copies of the Operation of Water Treatment Plants. Until reprints are available, we can supply copies of the May issue containing the chemistry article. We must make a charge for these, but will be glad to cooperate with individuals or groups to the maximum extent.)

THAT ORLANDO TREATMENT PLANT

In our article in the June issue of PUBLIC WORKS through an oversight we omitted to state that a large portion of the cast iron pressure sewers are being constructed by Saine Co., Inc., Orlando, on a construction-management basis. The estimated cost of the Saine Company's part of the work is $704,450 and this work is approximately 80% complete. It is expected that the work will be finished at less than the estimate, resulting in a saving to the city.

Many thanks for the extra copies and we appreciated the way you handled our article.

Smith & Gillespie
C. Wallace Smith,
Consulting Engineers,
Jacksonville, Fla.

Books of the Month

RAINFALL & RUNOFF

Covers the best methods of calculating probable distribution, frequencies and intensities of rainfall; and runoff from melting snow, floods and drainage areas. It tries to answer: How much rain will fall; when will it fall; what will be the runoff; what will be the peak runoff; and what ground water will be found in an area. By Edgar E. Foster. Macmillan Co., N. Y. $9.

PILE DRIVING

The 120-page catalog issued by McKiernan-Terry Corp., 15 Park Row, N. Y., is quite a text-book on pile hammers, pile extractors and pile driving rigs. More than 140 illustrations show on-the-job usage. Engineering data include formulas for the bearing power of piles, selection, specifications and operating set-ups. Sent when requested on your letterhead.

VEHICLE PARKING

A bulletin of the Highway Research Board, 2101 Constitution Ave., Washington, D. C., contains a Committee report on vehicle parking and three of the papers on this subject which were presented at the recent meeting of the Board. It represents the results of latest studies on this subject.

IRVINGTON *offers* **TECHNICAL AID TO THE CONTRACTOR**

When you plan to pour concrete, and there's going to be an unusual form problem—or a new twist on a more or less standard operation—tap Irvington's technical knowledge.

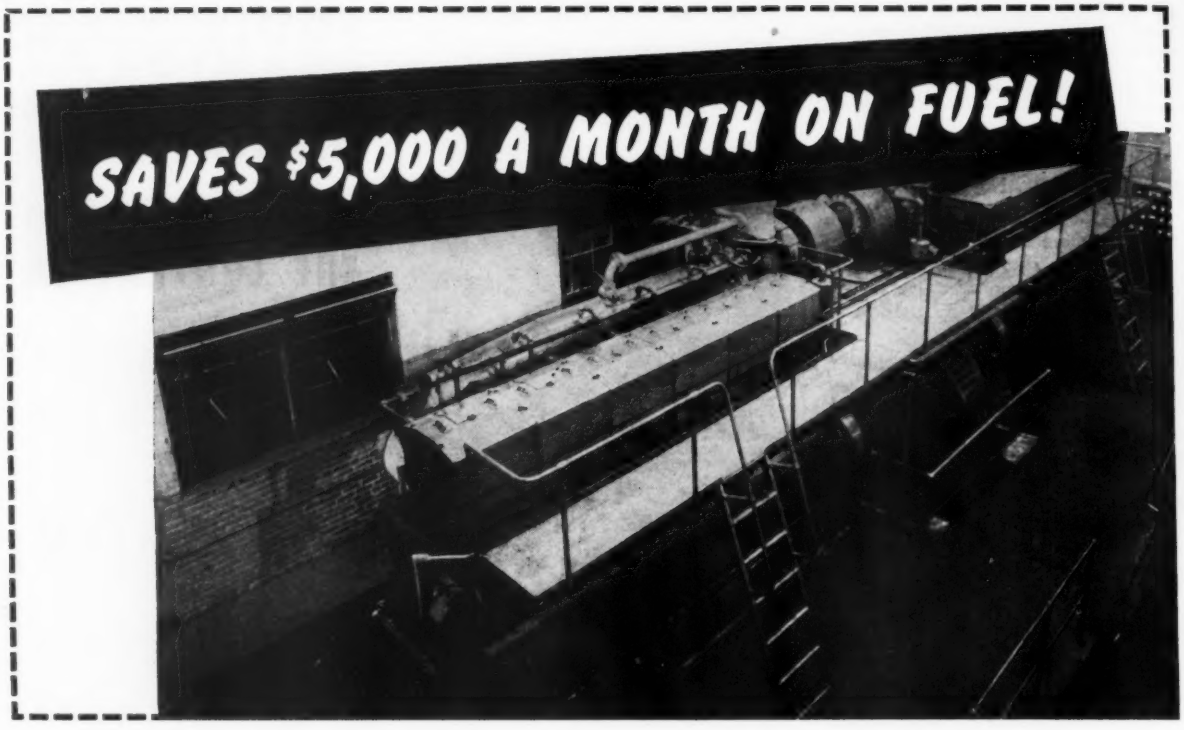
Our files, and the minds of our specially trained and experienced engineers, hold data, results, methods, know-how—and all those intangibles that cut corners, reduce costs, avoid headaches. These are the products of hundreds of jobs, the results of our own experiences and observations, as well as those of constructors who use our forms and report back.

MITTRY BROS. Construction Co. used a series of *standard* Atlas Speed Forms, placed *vertically,* for cantilever form construction on the Hulah Dam, in Hulah, Okla. which they are building for the Engineers Corps, U. S. Army. Irvington is gratified to say that its technical staff were called on by Mittry Bros. for consultation on some of the problems involved.

IRVINGTON FORM & TANK CORP.
IRVINGTON NEW YORK

WE HAVE A FORM PROBLEM!
Attach the coupon to your letterhead, mail to us. and a member of our staff will call on you.

When you need special information—consult the READERS' SERVICE DEPT. *on pages 65-69*



Worthington Gas-Diesel Engine Pays For Itself Fast, By Cutting City's Power Costs

In March, 1948, the Municipal Power Plant of Lafayette, La., installed this Worthington Engine — a Type SEHPG, Twin-Six, Supercharged Gas-Diesel. Supplementing previously installed Oil-Diesel equipment of various makes and sizes, the new Worthington has won unqualified praise for outstanding economy and dependability. Chief Engineer R. P. Hebert states:

"Cost of generating power with our Worthington Gas-Diesel is 2¼ mils per kw-hour. Our Oil-Diesel fuel cost is 9 mils per kw-hour. We are saving about $5,000 a month and figure the installation will pay for itself in about three years.

"Next to low fuel costs, as compared to the other units, the most remarkable feature of our Worthington Gas-Diesel is its low lube oil consumption. Estimates were 4,000 bhp per hr for each gallon of lube oil. Actually, we have been getting around 10,000 bhp per gallon.

"Maintenance cost on the Worthington has been low during steady operation."

Prime Movers... And Prime Savers

Worthington Diesels cover the entire range of municipal and industrial applications . . . It will pay you to get further facts on how they can meet your own particular requirements with the cost-saving, trouble-free performance that proves *there's more worth in Worthington.*

Write, stating your problems, to *Worthington Pump and Machinery Corporation, Engine Division, Buffalo, New York.*

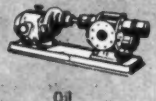
WORTHINGTON

YOUR PARTNER IN POWER PROGRESS

Diesel engines, 150 to 2,640 hp . . . gas engines, 175 to 1,720 hp . . . dual fuel engines, 225 to 2,640 hp.

WORTHINGTON-BUILT AUXILIARIES

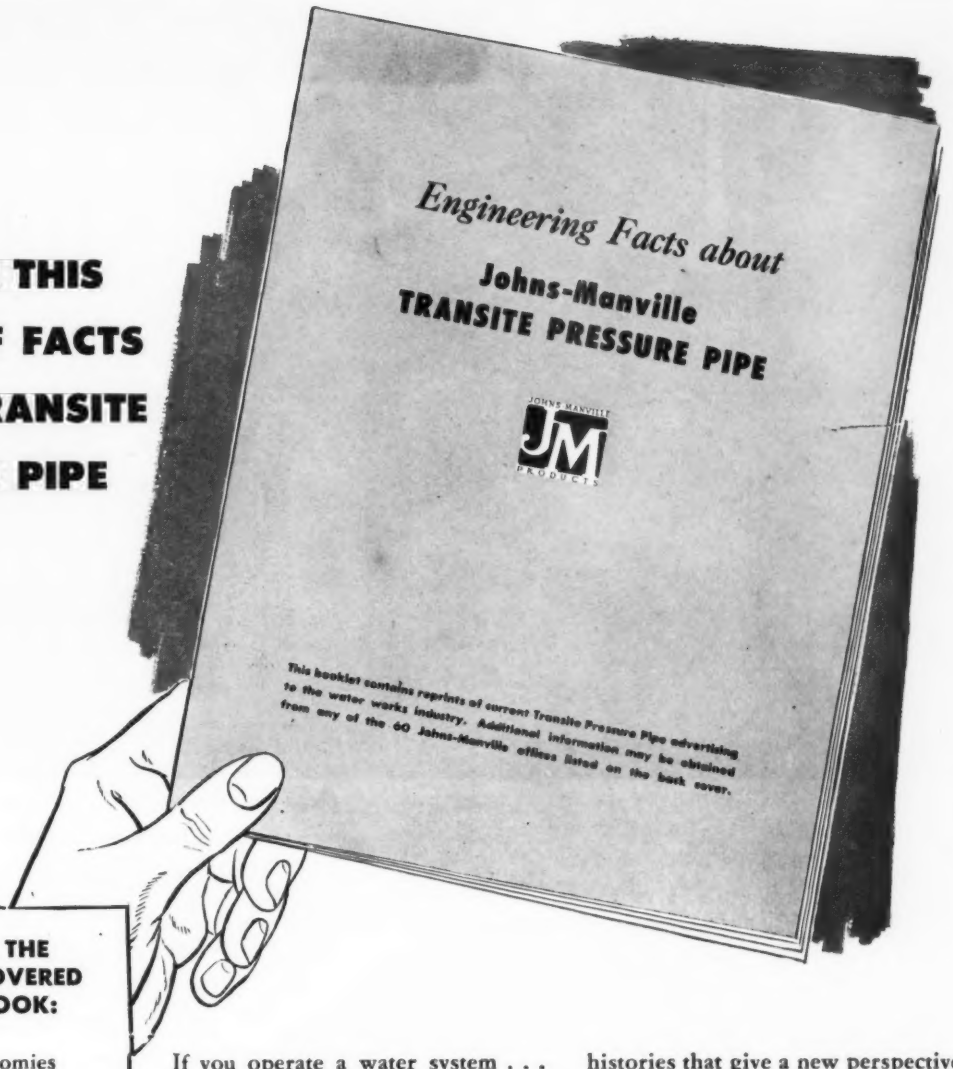
Balanced Angle Compressors


Oil Transfer Pumps

Cooling Water Circulating Pumps

Evaporative Type Engine Water Cooler

SEND FOR THIS DIGEST OF FACTS ABOUT TRANSITE PRESSURE PIPE


Engineering Facts about
Johns-Manville
TRANSITE PRESSURE PIPE
JOHNS MANVILLE
JM
PRODUCTS
This booklet contains reprints of current Transite Pressure Pipe advertising to the water works industry. Additional information may be obtained from any of the 60 Johns-Manville offices listed on the back cover.

SOME OF THE SUBJECTS COVERED IN THIS BOOK:

- Installation Economies
- Carrying Capacity
- The Simplex Coupling
- Making Service Connections
- Resistance to Corrosion —an Index of Long Life
- Case Histories
- Dimensions and other useful data

If you operate a water system . . . or are concerned with the design or construction of water works projects you'll find this digest of facts about Johns-Manville Transite* Pressure Pipe helpful.

A compilation of the advertisements in our current "Engineering Facts" series, it presents concise, factual information about Transite's many economic and engineering advantages . . . includes informative case histories that give a new perspective on how this asbestos-cement pipe meets today's requirements for a modern, efficient water carrier.

In addition, it contains dimensions and other useful data about Transite Pressure Pipe which you'll want to have in your files. A copy is yours for the asking. Write Johns-Manville, Box 290, New York 16, N. Y. or use the coupon below.

*Transite is a registered Johns-Manville trade mark

Johns-Manville TRANSITE PRESSURE PIPE

JM PRODUCTS

Johns-Manville
Box 290, New York 16, N. Y.

Send me a copy of "Engineering Facts about Johns-Manville Transite Pressure Pipe" (TR-78A).

Name_____

Organization_____

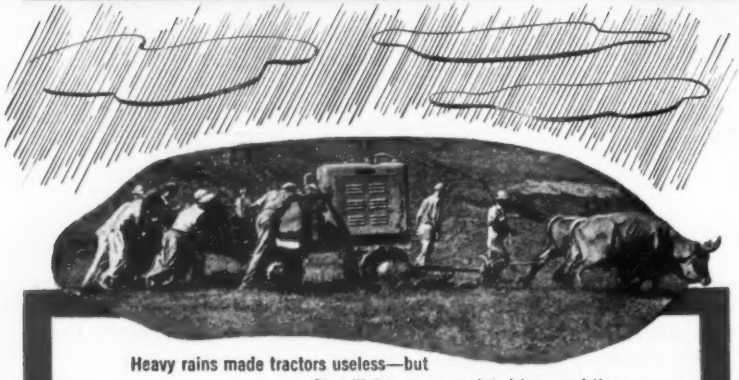
Address_____

PW-7

When you need special information—consult the READERS' SERVICE DEPT. on pages 65-69

Cuba's new Havana Aqueduct, completely protected from corrosion by Centrilining.

CENTRILINE *protects the new* HAVANA AQUEDUCT



Heavy rains made tractors useless—but Centrilining was completed in record time.

CENTRILINE CORPORATION

140 CEDAR STREET • NEW YORK 6, N. Y.

CEMENT MORTAR LININGS FOR WATER MAINS

CENTRIFUGALLY APPLIED
in strict conformity
with A.W.W.A. Specifications

▶▶ HAVANA'S BRAND NEW WELDED-STEEL AQUEDUCT HAS BEEN PERMANENTLY PROTECTED FROM TUBERCULATION AND LEAKAGE BY A THIN, DENSE CEMENT LINING PLACED BY THE CENTRILINE PROCESS.

The new pipe line—68" in diameter and 28,809' long—was built for the City of Havana by M. A. González del Valle, General Contractor. The steel pipe was fabricated and installed by Compania de Ingenieria Morgran, S. A. of Havana. Because it is a vital link in Havana's new system it was lined in place with centrifugally applied cement mortar.

This protective cement mortar lining will more than pay for itself within a few years through sustained carrying capacity and low pumping costs.

▶▶▶ Do you want the complete facts on Centrilining? Send for our 28-page illustrated bulletin.

Here's Why McCULLOCH Saws *start fast... and cut fast*

Conventional magneto, with coil inside flywheel, gives less spark at low speeds.

McCulloch magneto gives hotter spark at low speed. Magnetic lines of force are broken faster, because of higher rim speed at a given cranking rpm.

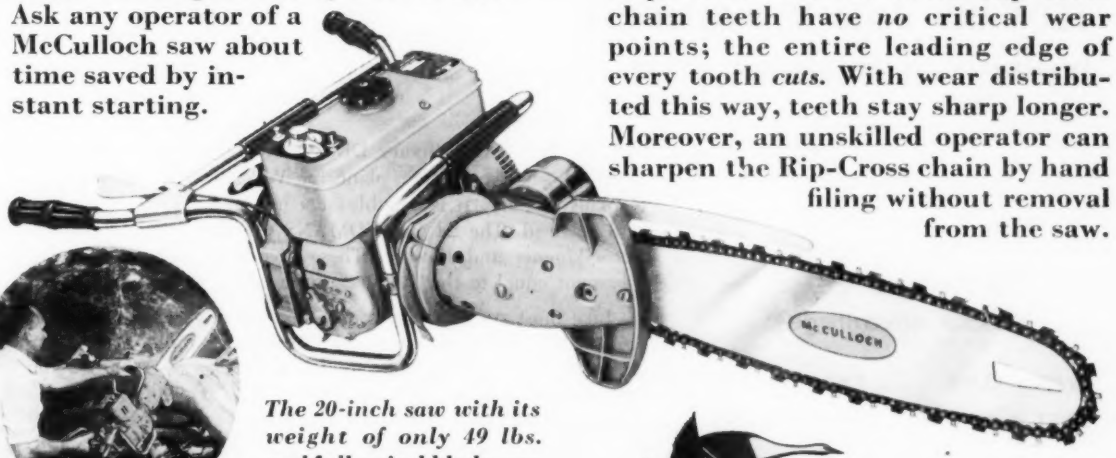
THESE FEATURES SAVE TIME IN TREE WORK

they start fast

The sketch shows how the McCulloch magneto differs from the conventional type. At any given cranking speed, magnetic lines of force are broken faster, giving a hotter spark at low speeds. The hotter spark means faster starting, in theory and in fact. Ask any operator of a McCulloch saw about time saved by instant starting.

they cut fast

The special curved teeth of the McCulloch Rip-Cross chain, driven by 5 honest hp, actually scoop out the wood—with or against the grain or at any angle, in any kind of hard or soft wood. And here's another important time-saver: the Rip-Cross chain teeth have *no* critical wear points; the entire leading edge of every tooth *cuts*. With wear distributed this way, teeth stay sharp longer. Moreover, an unskilled operator can sharpen the Rip-Cross chain by hand filing without removal from the saw.



The 20-inch saw with its weight of only 49 lbs. and full-swivel blade, can be easily operated in any position by one man.

McCULLOCH MOTORS Corporation

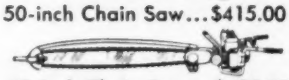
6101 W. Century Blvd., Los Angeles 45, Calif. Dept. M.P.

6 MODELS AVAILABLE—ALL INTERCHANGEABLE

20-inch Chain Saw...$385.00

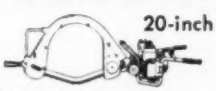
50-inch Chain Saw...$415.00

30-inch Chain Saw...$395.00



60-inch Chain Saw...$425.00

40-inch Chain Saw...$405.00



20-inch Bow Saw $425.00

All prices f. o. b. Los Angeles

SEND FOR FULL INFORMATION

McCULLOCH MOTORS CORPORATION
6101 W. Century Blvd., Los Angeles 45, Calif., Dept. M.P.
Please send complete information on the 5-hp McCulloch chain saw and name of nearest dealer.

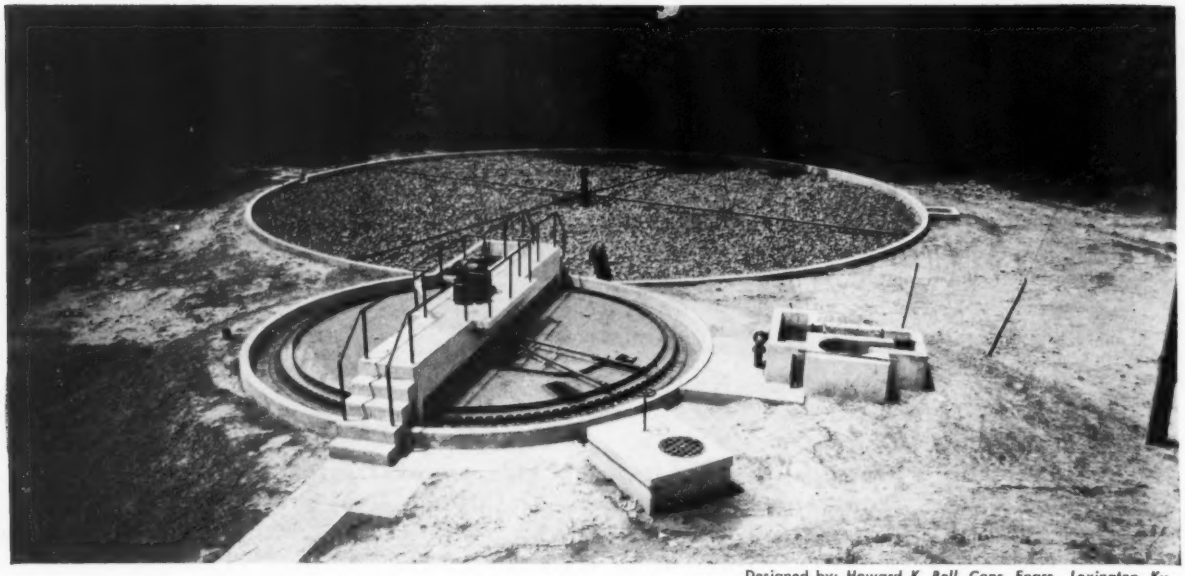
Name_____

Firm name_____ Type of work_____

Address_____ City_____ State_____

When you need special information—consult the READERS' SERVICE DEPT. *on pages 65-69*

TODAY'S FILTER PLANTS use *vitrified clay filter bottom blocks*



Designed by: *Howard K. Bell, Cons. Engrs., Lexington, Ky.*
Contractor: *E. H. Marhoefer, Jr., Chicago, Ill.*

YEOMANS Units in outstanding institutional treatment plant

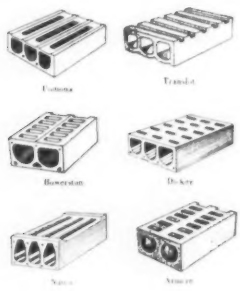
THIS YEOMANS Rotary Distributor and Clarifier unit makes an ideal small treatment plant for Western State Hospital at Hopkinsville, Ky. It is capable of a maximum flow of 350 g.p.m. at 3 ft. head. The 24 ft. YEOMANS Clarifier is equipped with the Auto-Skimmer and Flusher. These give this institution sewage treatment equal to that obtained by a city.

Like most trickling filters designed today, whether big or little, the trickling filter at Western State Hospital is built with underdrains of *Vitrified Clay Filter Bottom Blocks*. These are made to the strictest specifications by members of the Trickling Filter Floor Institute. They give lifetime, trouble-free service. Large glazed ducts insure high velocity during low flow. Exact alignment is easy and light weight makes laying simple for unskilled labor. Widespread ventilation of the entire bed is rapid and uniform.

For other engineering data, write any members of this Institute.

Check these special advantages:

WON'T CLOG **EASY TO LAY**
LAST A LIFETIME **RESIST ACIDS**

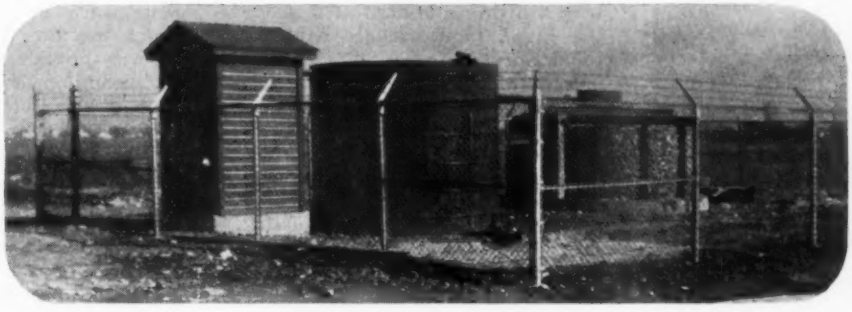


TRICKLING FILTER FLOOR INSTITUTE

W.S. DICKEY CLAY MFG. CO. Kansas City 6, Mo. — AYER-McCAREL-REAGAN CLAY CO. Brazil, Ind. — NATIONAL FIREPROOFING CORP. Pittsburgh 12, Pa. — BOWERSTON SHALE CO. Bowerston, Ohio — POMONA TERRA-COTTA CO. Pomona, N. C. — TEXAS VITRIFIED PIPE CO. Mineral Wells, Tex.

PUBLIC WORKS MAGAZINE

JULY • 1949 VOL. 80 • NO. 7



TEMPORARY COMPLETE
Sewage Treatment for a School

COMPLETE sewage treatment, designed to operate for a minimum of five years, was installed at the Southwest Side School in North Lake Village, Ill. Due to adverse soil conditions, and to other factors, the use of a septic tank and subsurface irrigation was not considered satisfactory. Since it was expected that sewerage facilities would be constructed to serve the school within a 5-year period, the new plant was designed and constructed on that basis. Approval of this policy was obtained from local authorities and from the State Department of Health. Cheaper construction methods and material were used than would normally be utilized for permanent installations. Wooden tanks, Transite partitions and weirs, and cyclone wire fencing for filter retaining walls were used.

Bases of Design

The plant was designed for a population of 180 school children at 4,000 gallons per 8 hour school day. All retention periods and filter loading were based on this flow rather than on a full 24-hour flow period. The estimated 5-day BOD was assumed to be 200 ppm for design purposes, although it is likely that the maximum will never exceed 180 ppm, with the average in the neighborhood of 150 ppm. These figures are not from actual tests on the plant, but are estimated from previous tests on similar installations, made by the writer. Further design data in this regard will be mentioned in the description of the individual units of the plant.

Topographical Conditions

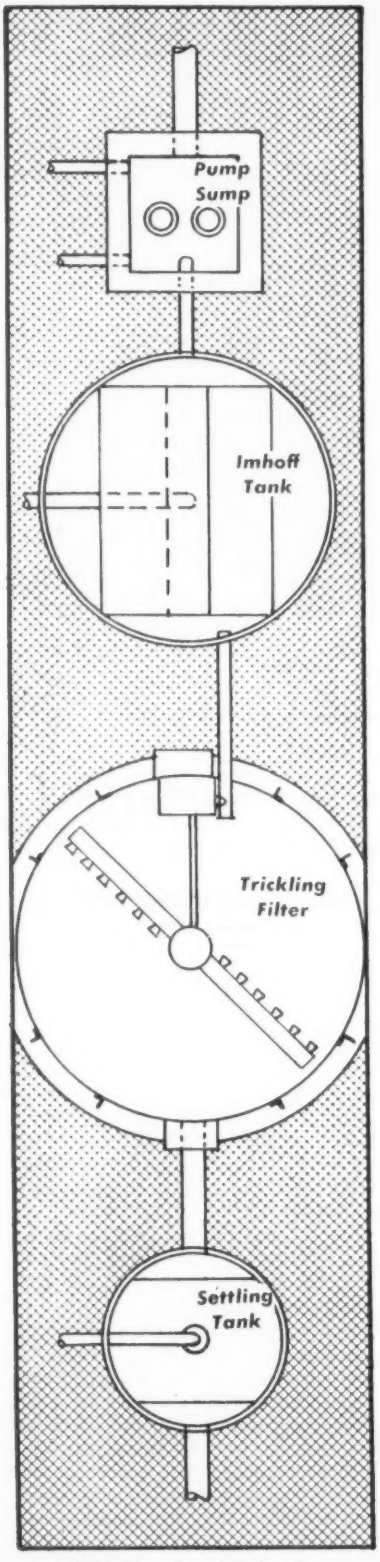
Since the surrounding topography is flat and surface drainage is poor, it was decided to elevate the units to obtain a greater head for final disposal of the effluent. Therefore, it was necessary that the raw sewage be pumped into the primary treatment unit. Naturally, some form of screening is generally provided prior to pumping; however, in view of operational difficulties common to small installations, screening was omitted from the design, and after more than a year of operation no pump clogging troubles have been experienced.

ROBERT T. RICHEY, Sanitary Engineer
JOHN DOLIO, Consulting Engineer, Chicago, Ill.

Pumping Data and Imhoff Tank Design

The pumping facilities consist of a Yeoman's duplex non-clog sewage ejector with a capacity of 25 gallons per minute per pump at a 20-ft. head. Facilities for alternate operation of the pumps, as well as for dual operation, if required, are provided. The motor characteristics are 1 hp, 1200-rpm, 3-phase, 208 volts. The raw sewage receiving wet well is of reinforced concrete and protection of the pump installation is provided by a small wooden house, which also houses the required starters, switches, alternators, etc.

The raw sewage is pumped a vertical distance of approximately 17 feet into a circular Imhoff tank. This tank was constructed of good grade cypress wood and is 10'0" diameter by 14'6" deep, overall. The settling compartment is partitioned by ¼" Transite sheeting and has a net capacity of 1260 gallons—a retention period at design flow of 2.52 hours. In order to provide sludge hoppers, lean concrete was poured into the bottom of the wooden tank with a 2-ft. diameter circle at the bottom, the resulting cone walls



● *LAYOUT of school treatment plant showing pump sump at top, Imhoff tank, filter and final settling tank. Filter media is retained by woven wire fencing.*

sloping at an angle of 45 degrees. The sludge compartment provides 376 cubic ft. of raw and digested sludge capacity, or 2.1 cu. ft. per capita. Gas vent area is approximately 28% of total sludge digestion compartment area. Sludge drawoff piping is 4″ cast iron, the "spider" keeping the bottom of the drawoff pipe 8″ above the bottom of the hopper. The pipe is sloped at an angle of 60% from the horizontal, with a hydrostatic head of 8′ above the outlet. In accordance with the requirements of the State of Illinois, an 8″ slot is provided for sedimentation, with a 6″ effective overlap of the Transite partitions forming the settling compartment.

An inlet baffle of Transite was placed 12″ from the pump discharge pipe, extending 12″ above and below the liquid level. At the discharge end of the Imhoff tank the primary effluent is discharged through a 3″ feed pipe to the filter distributing mechanism.

Trickling Filter Details

The trickling filter is a standard rate circular filter bed 12′0″ in diameter with a 6′0″ media depth above the underdrain collection system, which consists of approximately 102 sq. ft. of vitrified tile filter underdrains. In lieu of the usual retaining wall of reinforced concrete, an 18″ high concrete base was provided, into which angle iron posts were set to support standard 2″ mesh cyclone wire fencing. From operating experiences, the writer now questions the wisdom of this type of retaining wall and believes that some form of wood or other construction would be more advantageous due to temperature conditions in the winter. Open construction is ideal in the warmer seasons, except for the fact that it would be difficult to maintain adequate control of Psychoda with open-type construction.

The size of the filter unit was determined roughly on the basis of 400 pounds of 5-day BOD per acre foot applied to the unit over an 8-hour period assuming about 33% efficiency through the Imhoff tank. It might be pointed out that although calculations based on this loading indicate a filter diameter of only slightly over 10′, it was deemed desirable to overdesign this unit, looking toward an increase in children attending the school prior to the installation of the sewer facilities. The increase in initial cost was too small to warrant "skimping." Further, a larger unit aids in better operation results with an intermittently operated plant. Media consists of about 25 cubic yards of stone, averaging approximately 3″.

Distribution of the applied primary effluent is obtained with a Yeoman's "Water-Wheel" rotary distributor. This mechanism was chosen because of the low head requirements from the primary effluent liquid elevation to the top of the filter media. Since a major factor in biological filtration of sewage is maintainance of a constant flow through the filter media, recirculation was provided to maintain a "wet" condition in the filter during the hours when the school is not in use and over week-ends. The recirculation is accomplished by continuous withdrawal of settled filter effluent from the bottom of the secondary settling tank. This is returned through a 4″ cast iron line to the raw sewage pump basin.

From the operational standpoint, it might be well to mention that some difficulties were experienced last winter due to the formation of ice on the distributing mechanism and the consequent freezing of the distributor. Naturally, this should not occur with a plant operating full-time, and this factor was overlooked in the initial design; however, the filter unit is to be covered for next winter's operation and the effect on the continuous operation of the unit will be noted with interest. In this regard, a sewage treatment plant has been recently designed by this firm for an industrial installation in the western part of the United States, where the minimum temperatures are expected to reach 20 degrees below zero. An identical, although larger, type of distributing mechanism has been used in the initial design and covering of the filter has been recommended, even though the retaining walls are of reinforced concrete and it is expected that a constant flow will be received at the plant. The effect of sub-zero weather on plant operation should prove very interesting in this case.

Final Settling; Other Details

To return to the installation considered in this paper, the effluent from the trickling filter is discharged into a 6′0″ diameter by 6′0″ deep, overall, circular final settling tank of the same material (cypress) as the Imhoff tank. No hopper was provided in this unit. An inlet Baffle of Transite sheeting is provided and the final effluent passes over a Transite weir into a Transite trough and thence into the outfall sewer. Ulti-

(Continued on page 32)

What HOUSTON did to protect its water supply

THE sanitary protection of a water system which supplies half a million people is a serious responsibility. Clyde Harvill, sanitary engineer of the Water Division of Houston, Tex., in his report for 1948, outlines some of the procedures and controls employed by that city and the results obtained from them. The present supply of the city is from wells, but the future supply will come from the San Jacinto River. Pending use of that supply, three new wells were put into service and another started. One of the wells drilled was completed at a depth of 2530 ft. and is the deepest water well in that section of Texas. At the close of the year, there were 33 producing wells and one well completed but not connected.

Chlorination

Prechlorination ahead of the reservoirs replaced ammonia-induced break-point chlorination during the year. No difficulties were encountered in the changeover, which was made gradually, and there were no significant alterations in the bacteriological quality of the water. Coliform group occurrence (where USPHS Standards allow 10%) was 0.50% for the supply wells; 0.43% for the reservoirs; 0.07% for plant tops; and 1.45% for the distribution system. Chlorine demand curves were run on all wells and the chlorine dosage readjusted in accordance therewith. Chlorine dosage was reduced from an average 1.76 ppm in 1947 to 1.48 ppm in 1948; and the chlorine residual of the water entering the distribution system was reduced from 0.89 ppm to 0.79 ppm, without, as previously stated, affecting the quality of the water. In the distribution system, chlorine residual varied from 0.4 ppm to 0.7 ppm. The cost of chlorination amounted to only 35.7c per mg. Including ammoniation, which was used to some extent during the first half of 1948, the cost of chlorinating the water amounted to 38.25c per mg.

A Wallace & Tiernan Amperometric Residual Chlorine Recorder was installed in October at the South End Plants, and then moved to other plants for test work, as it was being used on an experimental basis. Experience indicates that the equipment furnishes accurate data which permits a very satisfactory control of water treatment.

Sterilizing Mains; Dead Ends

A total of 43.96 miles of new mains, or 232,122 ft., were disinfected. Rechlorination until satisfactory disinfection was obtained was necessary on the 26.0 miles of mains.

At the end of the year there were 274 dead ends in the distribution system, and a serious need exists for a fixed policy preventing the construction of additional dead ends. Constant attention was necessary to maintain satisfactory water in these dead ends. Approximately 50% of the night main flushing program is devoted to flushing dead end mains.

Residual chlorine recorder permits accurate control of treatment.

Cross-Connection Control

An ambitious cross-connection control program was carried out during the year. All listed properties which had not been surveyed in the past 5 years were checked. It was found that many of these properties had undergone alterations and data on water piping was no longer correct. Surveys of 139 properties, located 15 cross-connections, all of which were eliminated. Surveys of 143 properties not previously surveyed located one cross-connection, which was also eliminated.

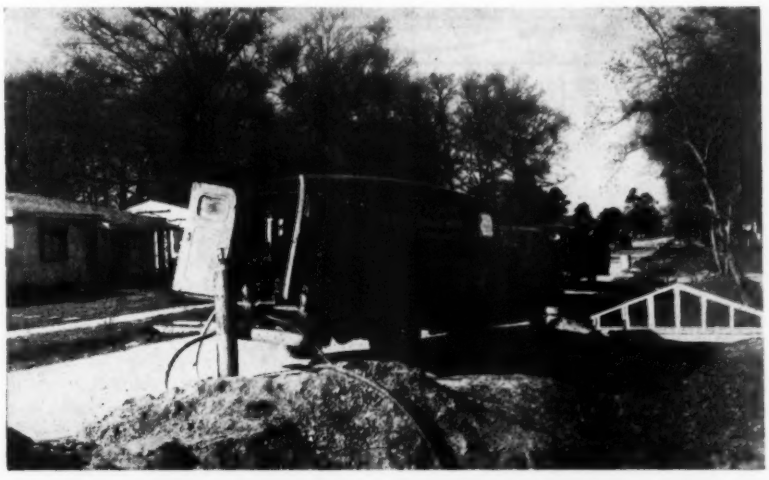
Following findings in several school buildings of sanitary defects in water lines, 90 schools supplied by city water were surveyed. In 14 of these buildings conditions existed which could allow back-siphonage into the water system. Also in these buildings, it was found that water service lines and meters were of inadequate size to care for the numbers of pupils in attendance.

Water Analysis and Testing

A detailed study of the water requirements for each of these schools was made and recommendations presented to the school system for an expenditure of $12,700. Work of correction was in progress at the end of the year. Also, the schools agreed to install flushometer type valves with vacuum breakers and to replace unsatisfactory drinking fountains.

Extension of water service to areas

(Continued on page 36)



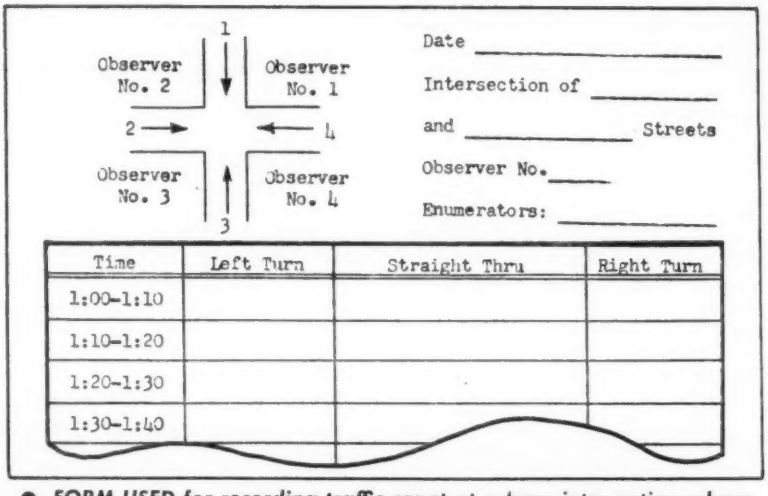
● ***STERILIZING equipment for disinfecting water mains is mounted on a truck for mobility. It is shown here at work in the field.***

A Simple Method FOR SMALL COMMUNITY

WILLIAM S. BONNER
Research Asst., Institute of Community Development, University of Oklahoma

OFFICIALS of small communities would be much more willing to undertake traffic planning if they had tools that they could readily use to do the job. Methods for gathering needed traffic data in communities of 30,000 or less have not received their fair share of attention. Most of the literature available concerning traffic surveys and survey methods has been prepared for cities with sufficient personnel and funds to undertake the various phases of a basic traffic planning survey. The traffic problems of a small community are quite simple when compared with those of a large city. The methods used to study these problems should also be simple.

It is our purpose to present suggestions for simplifying the basic traffic planning survey for the smaller community and for preparing and executing its motor vehicle volume count. It is recognized that there are many other factors involved in traffic planning than are presented here. However, two important items are treated in the hope that greater consideration may, in the future, be given to the solution of traffic planning problems of small communities.



● ***FORM USED for recording traffic count at a busy intersection where four observers must be stationed.***

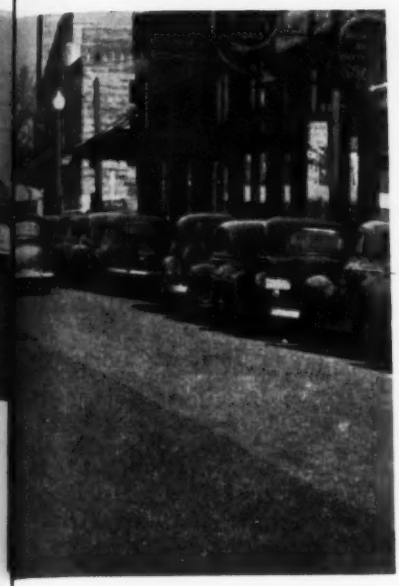
The Basic Traffic Planning Survey

It is generally recommended in making a basic traffic planning survey that five individual and separate surveys be undertaken. These are:

1. Motor vehicle volume count—a record by time periods of the volume and direction of movement of motor vehicles.
2. Cordon count—the determination of the number of vehicles entering and leaving an area over a specified period of time.
3. Origin-destination count—the determination of where the motor vehicles on the streets come from and what their destination is.
4. Major route congestion survey—the traffic "bottlenecks" in the street system.
5. Street and off-street parking survey—where cars can and do park, for how long, and who does the parking.

It should be possible for the small community to secure the necessary data for traffic planning without undertaking separately each of the five surveys.

Through careful preparation and execution of a motor vehicle volume count, it should be possible to eliminate the cordon count, the origin-



The selection in a small community of a normal day for making a motor vehicle volume count is one of local determination. The Chamber of Commerce or local business and industrial concerns should be contacted as to what day of the week is considered an average business day. The first three or four days of each month will not be normal as a larger number of people will be banking and paying bills. There should be no special occasions on the day of the count as carnivals, athletic events, dollar days, parades, or conferences. All major streets within the community and all major roads leading into the community must be open for normal traffic.

Short-count stations are established at the minor points. Traffic flow from at least one master station must always pass through the short-count stations. Data gathered at the short-count station can be used to establish a ratio between the short-count and master count station for determining traffic flow at the short-count station for the full period of the count. There are no specific hours for gathering traffic data at short-count stations. It is good practice to make the count for at least one hour, preferably two, and to have the period include both slack and heavy movement of traffic.

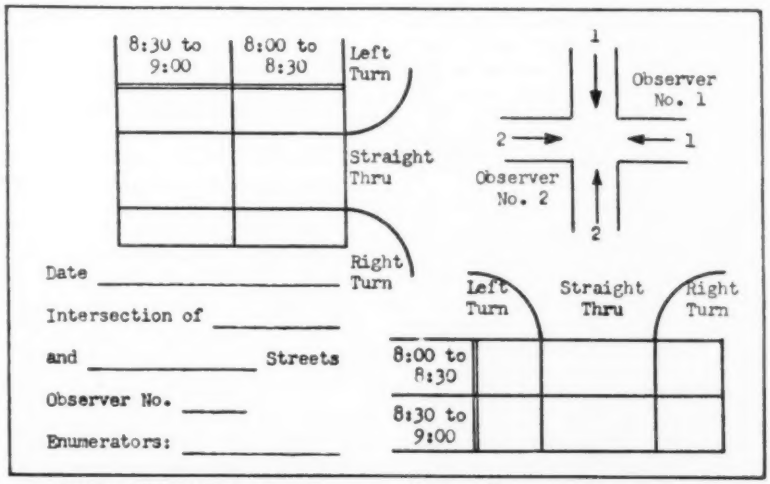
BASIC TRAFFIC PLANNING

destination count, and the major route congestion survey. A small community generally has no need for a special cordon count. The number of cars entering and leaving the community can readily be determined from the volume count. The number of vehicles entering and leaving any specific internal area of the community can also be determined from the volume count by properly locating traffic count stations.

The small community rarely has need for a separate origin-destination survey. The origin of traffic within the community can be determined by areas from the volume flow count. An analysis of traffic entering and leaving the community at its limits will give further information as to the origin and destination of traffic.

Major route congestion can be determined from the volume of traffic flow, knowledge of existing street widths, and street parking conditions. While more information than merely volume flow is necessary in studying route congestion, it does not entail a completely separate survey. Due to the nature of the small community, areas of congestion are readily identified and causes of the condition easily determined.

A small community can, as a rule, secure sufficient basic data through a motor vehicle volume count and a parking survey to undertake traffic planning. With these data, it is possible for the community to take steps to relieve present unsatisfactory traffic conditions and to prepare long-range traffic plans.



● ***TWO OBSERVERS standing on diagonally opposite corners can record all movement of light traffic.***

Preparing and Executing a Motor Vehicle Volume Count

It is recognized that the small community cannot undertake a traffic count extending over a considerable period of time as it must rely on volunteer personnel to do the actual work. The count generally must be made in one day. Such a volume count requires careful preparation and execution if the data secured are to be accurate and useful. There are six items that should be given careful consideration in the preparation and execution of the survey. These are:

1. *Preliminary Organization.*—The following should be considered in the preparation of a one-day motor vehicle volume count:

(1) The selection of a day that has normal or average traffic characteristics. For most communities this will generally be a business day.

(2) Avoid selecting a day that has some special occasion which will disrupt normal traffic flow or will cause an abnormal increase

or decrease in number of cars.

(3) A valid traffic flow picture cannot be secured if any major streets are closed for repair or construction. All major streets should be in normal state of use when the count is made. The same is true for major highways leading into the community. If the community attracts large farmer patronage, the rural roads should be passable on the day the count is made.

(4) The length of the count should be such as to cover all major movements of traffic during the day; that is, movements of vehicles going to and from work, and to and from shopping and recreation areas.

(5) To determine maximum hourly flow, the count should be recorded on the basis of half-hour intervals.

(6) At intersections where traffic controls are used or their use is contemplated, the count should be recorded by five- or ten-minute intervals.

(7) To secure an accurate flow picture, all turning motions at intersections should be recorded.

(8) Secure all traffic data available for the past ten to twenty years from the State Highway Department for all routes entering the community. (This information forms a basis for anticipating future through traffic.)

2. *Recruitment of Personnel.*—From past experience in other communities and cities, the Boy Scouts and the Girl Scouts of America have proven to be the best sources of manpower to conduct traffic count. If it is necessary to secure other personnel, high school students might be utilized. If school is in session on the day the count is made, cooperation of school officials is necessary for securing release of the personnel.

3. *Selection of Traffic Count Stations.*—Two types of traffic count stations may be established. One is the master or long-count station, and the other is the short-count station.

(1) The master or long-count station is one at which the count is taken for the full-time period of the count. Master count stations are generally situated at major intersections and at the limits of the city on major highways. These stations furnish the core data of the count.

(2) A short-count station is one at which the traffic is counted for only one or two hours. Short-count stations are utilized when personnel available are limited in number or when such a count will furnish the necessary data desired.

(3) Each traffic count station should tie in with another station. By "tie in" is meant that the major traffic flow of one station will pass through another station. Each master count station should tie in with another master count station. A short-count station should tie in with at least one master count station or with two short-count stations that are tied in with master stations. This is necessary in order that traffic data can be correlated.

(4) Traffic count stations should be placed at all places where there is a major change in the flow resulting from merging or turning traffic.

FACTS NEEDED

Any program that a community undertakes to improve traffic circulation should be based on facts. The motor vehicle volume count records the direction, volume, and turning movements of traffic. From it, it is possible to determine the general origin and destination of motor vehicles as well as the cordon count. The data collected are valuable in determining the need for traffic control at intersections, the type of traffic control that would be most efficient, and in determining timing cycles for traffic signals. Also in determining the need for additional major streets, and as a basis for determining priority in a street improvement and paving program. The motor vehicle volume count makes it possible for facts to replace opinion in making decisions in preparing a community program of street improvements and traffic control.

4. *Preparation of Forms.*—When untrained personnel are utilized, the job of each individual observer should be reasonably simple and the forms the observer utilizes should be easy to understand and to use.

(1) At busy intersections, it is best that each observer record the traffic approaching the intersection from one direction on one street and record only the movement of that traffic. At a right angle intersection it will take four observers to record traffic movement.

(2) At intersections that have relatively light traffic, two observers standing on diagonal corners, can record the movements of traffic approaching the intersection on the streets to the left and right of the observer.

(3) Forms used should be simple. Spaces used for recording vehicles should be large enough to allow the observer to record easily and quickly.

(4) When number of observers needed for each station has been determined, the forms should be prepared. Suitable forms are shown herewith. These provide a small diagram of the intersection. The position of each observer is shown on the diagram and arrows indicate street or streets for which each observer is responsible. Form A is suggested for a right angle intersection requiring four observers and form B is for the right angle intersection requiring two observers.

(5) For each station a packet can be made of the forms needed by each observer for the complete count. Intersection and observer number data are filled in as packets are prepared. The forms for each observer are clipped together. On the outside of the packet is glued a full sheet diagram of the intersection showing the position of each counter. On the diagram will be written the physical description of each corner. Thus each observer can place himself at the correct station and will count the traffic on the correct streets.

(6) Included with the packet should be suitable backings, as clipboards, for use of the observers with sufficient rubber bands to hold paper securely in position even on windy days.

(7) Special forms should be prepared for intersections that are not of the right angle, four corner type.

5. *Briefing of Personnel.*—The personnel used in the count must be organized in advance of the actual count.

(1) A captain should be selected for each station. These captains are to be in charge of the observers at their respective stations and must be present throughout the complete count. It is their job to see that the

(Continued on page 57)

DIESEL POWER PAYS DIVIDENDS

T. J. MALONE

THE municipal power plant of Blooming Prairie, Minn., began operating in April, 1931, with two diesel engines of 120 and 240 hp., and a rated alternator capacity of 227 kw. In its first twelve months it produced 311,343 kwh. A third diesel unit was put in operation in December, 1937, of 450 hp and 300 kw, and a fourth in August, 1948, of 1,000 hp and 690 kw. The fourth unit gave the plant setup a reserve capacity of 757 kw over the latest peak demand. All diesels were supplied by Fairbanks, Morse & Co. In the calendar year 1947 production totaled 1,474,427 kwh. The 1948 production probably exceeded 1,800,000 kwh.

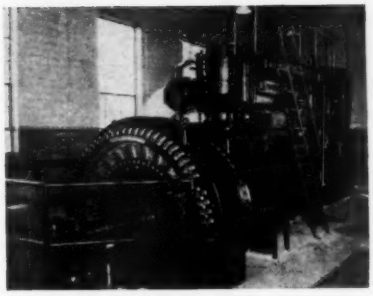
Earnings of the plant, dating from the first day of operation, have retired, with interest, all debt obligations when due or even before. Besides, they have paid for various capital purposes not cared for by borrowing, as extensions to the distribution system, landscaping grounds and purchase of equipment and supplies.

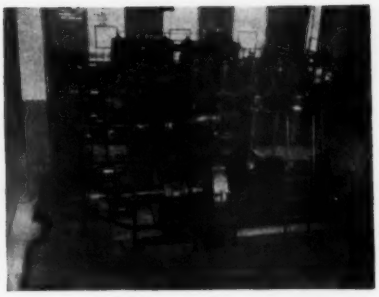
Table I presents the story of the full ten years, 1938 to 1947; and gives some data for nine months of operation in 1948.

Higher generation costs and delivered costs in the late years reflect, of course, the increasing prices of fuel oil, other supplies and things in general.

Of the 1947 volume distributed, 482,254 kwh went to residential, 358,171 kwh to commercial light, 135,748 kwh to power, and 229,659 kwh to water heating. Water pumping, which is billed and paid for; street lighting, paid for in part; and certain free services account for the rest of distribution. The village pays the light fund $100 a month on street lighting and the plant absorbs the rest of its cost, about $200 a month. Energy goes free to the Community Building, park, skating rink, fire hall and school athletic field.

Free services given the Community Building are peculiarly within the province of a municipal plant. These include light, power, heat (by jacket water from the engines) and custodial care. The water department, separate from but operated by the electric department, supplies free water.





● ***NEW DIESEL at left above. Other three diesels—120, 240 and 450 horsepower — at right. Below is view of the power building.***

When the diesel plant began operating, the top consumer rate in the residential schedule was 11 cents. Four reductions in rates were made in the first seven years. Rates effective December 1, 1937, were still in force eleven years later except for a one-cent reduction throughout in the commercial light schedule and a reduction above 750 kwh in the power schedule. Present rates, monthly, are:

Residential—First 40 kwh at 7 cents; next 100 kwh at 3 cents; excess at 2 cents. Minimum, $1.00.

Commercial light—First 100 kwh at 6 cents; next 100 at 5 cents; next 100 at 4 cents; next 200 at 3 cents; excess at 2 cents.

Power—First 250 kwh at 6 cents; next 250 at 5 cents; next 250 at 4 cents; next 250 at 3 cents; excess at 2 cents.

Water heating, which had been one cent a kwh, was raised to 1.5 cent in the summer of 1948. There were 596 meters in service late in that year, 80 electric stoves and 100 water heaters.

A commission of three members directs the electric plant. Members are Dr. T. P. Goldberg, George Day and A. L. Fosteson. Dr. Goldberg has served for eight years. Superintendent Mack has held the position from the beginning.

At the end of 1947 valuation of the physical plant was $172,699.

TABLE I

Year	Gross kwh volume generated	kwh per gal. of fuel oil	Av. generation cost per kwh	Av. cost delv. per kwh gen'd	Av. revenue per kwh gen'd	Peak load, kw	Rated kw cap'y
1938	740,225	10.41	1.26 cts	1.69 cts	3.75 cts	260	527
1939	793,010	11.20	1.48	1.66	4.42	240	527
1940	858,677	10.78	1.48	1.77	4.20	280	527
1941	934,215	10.89	1.22	1.51	3.43	310	527
1942	974,485	11.12	1.02	1.46	3.33	280	527
1943	985,492	10.99	1.15	1.55	3.28	280	527
1944	1,098,042	11.24	1.45	1.73	3.16	300	527
1945	1,135,092	11.20	1.15	1.51	3.14	325	527
1946	1,257,826	11.10	1.48	1.67	3.01	382	527
1947	1,474,427	11.65	1.49	1.80	2.86	450	527
1948							
9 mos.	1,275,100	11.36	...	...	...	460	1,217

PROPER DIAGNOSIS *is the Key to* GOOD PAVEMENT MAINTENANCE

J. E. LAWRENCE, Maintenance Engineer, and
R. E. PYNE, Assistant, Massachusetts Dept. of Public Works

RECENT surveys indicate that since the end of the war about 60% of the counties have had major turnovers in personnel. This article is intended primarily to provide the newcomer in the maintenance field with a general discussion of the procedures in the maintenance of various types of pavements.

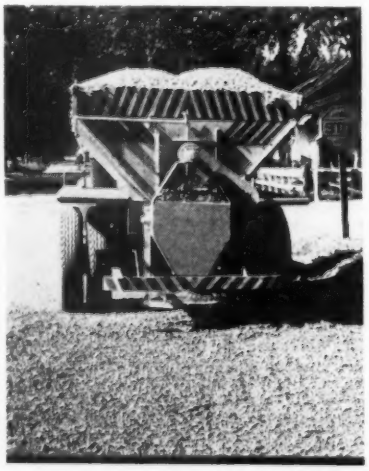
A recent report prepared by the Department of Maintenance of the Highway Research Board indicates that exactly 50% of the expenditures for maintenance and operation of state highway systems in 1948 was required for surface maintenance. It is logical to conclude that this percentage would also apply to county, city and town maintenance. Therefore, if the public official is to extend to the highway user efficient service, primary consideration must be given to the maintenance of the roadway surface.

Organization for Maintenance

For maintenance purposes the highway system is generally divided into sections for which a section crew or gang is responsible. The mileage of a section will vary with a number of factors including the consideration of urban and rural areas, type and width of highway, topographical features and local conditions. We shall analyze an average section of from 40 to 50 miles of highway. A typical maintenance organization required to take care of the roadway surfaces of such a section would be as follows: 1 foreman; 1 sub-foreman; 2 chauffeur - laborers; 1 equipment operator; 2 skilled laborers; and 6 laborers.

The designation of titles varies considerably in different locations, as job classification authorities are not in general agreement on position titles. Also it is sometimes necessary to augment the regular crew for special operations either by drawing from adjacent sections or hiring temporary help.

The permanently assigned equipment of our typical section for surface maintenance would be: one ½-ton pick-up truck; two 3-ton dump trucks; one 3 to 5-ton portable roller; one 60-cubic foot compressor; one 100-gallon heating kettle; one 350-gallon bituminous spray tank; and one aggregate spreader. In addition there should be available for part-time assignment a power grader, an 8 to 10-ton roller, and a pressure distributor in locations where such facilities are not made available through local bituminous material suppliers.



Courtesy Baughman

● ***MECHANICAL spreader applying light cover coat of aggregate to highway.***

Diagnosing Troubles

Proper analysis of the cause of surface failure is more important than hurried correction of visual surface breaks. It is assumed that patrol crews will patch holes immediately, and when weather conditions are adverse, these patches may be of a temporary nature. However, before permanent repairs are made, the reason for the failure should be analyzed.

Failures due to settlement or erosion of the foundation are common. These failures are generally due to the presence of silt, clay or other unstable material in the subgrade, permitting the admission and trapping of water beneath the surface. This condition must be corrected before permanent repairs can be made to the surface. Pumping at joints is another indication of an unstable subgrade. Removal of the unsatisfactory material and replacement with proper material in the subgrade is the best solution. This may not always be practicable but at least an effort can be made to lower the water table and reduce the height to which capillary water can rise. Often this can be done by the installation of side drains or bleeders.

Surface failures which are not due to subgrade or foundation defects are caused by one or more of several factors. Much has been written on the causes of scaling on reinforced cement concrete pavements and no attempt will be made here to summarize the conclusions. Bituminous concrete pavement failures may be the result of improper design of the mix, of faulty laying of the material, or to underdesign for heavy traffic. Failures in penetration macadam surfaces are caused by oxidation of the bituminous material at the surface. If this condition

is observed over a considerable length of the road, arrangements should be made to have a surface treatment applied as soon as possible in order to prevent the loss of the top stone

After diagnosing the trouble the next step is to take the proper corrective measure, either patching, surface treatment, resurfacing or combinations of two or possibly all three methods. At this point it is necessary to consider both economics and engineering.

A few of the methods for repairs to bituminous and cement concrete surfaces will be discussed below. Resurfacing, or the building up of the existing surface beyond one inch, is usually considered as reconstruction and beyond the scope of routine maintenance. The selection of the grade and type of bitumen depends on the condition and type of the surface to be patched or treated and the final results desired. The manufacturers of bituminous material make available many excellent publications setting forth their recommendations on the proper grade of their product for all conditions.

One important point to remember in the use of any bituminous material is that where there is a question as to the quantity to use it is always safer to be on the light side. You can always add bitumen to the road, but the process of removing an excess of bituminous material from the surface is very expensive.

Patching Bituminous Surfaces

Temporary patches should be made only when weather conditions do not warrant a permanent patch, or during the period when settlement is taking place. Stockpiled premixed cold patch with medium curing bitumen as a binder provides an efficient temporary material. The bitumen content of the mix should be between 5% and 6% of the weight of the aggregate, as an excess of bitumen will cause it to roll under traffic. Compaction by rolling is recommended; where this is not available, provisions for tamping should be made.

Permanent patches should be made, whenever possible, with the same materials that were used in the original construction. All loose material should be removed and the edges cut square and with vertical sides. After the base course is trued up and the edges painted with rapid curing asphalt or emulsion, the patching material should be placed in the hole in layers not over 2 inches thick. If more than one layer is required the edges of the patch should be protected with wood strips of the proper thickness where the roller goes on and off the patch.

Paint patching is recommended where only small areas show signs of raveling. This is classed as preventive maintenance. After brooming the area, the bitumen should be applied at the rate of from 0.2 to 0.4 gallon per square yard, covered with 20 to 35 pounds per square yard of cover stone and rolled. It is usually necessary to permit traffic to use the patched area almost immediately so a quick setting bituminous material is recommended.

Surface Treatment of Bituminous Surfaces

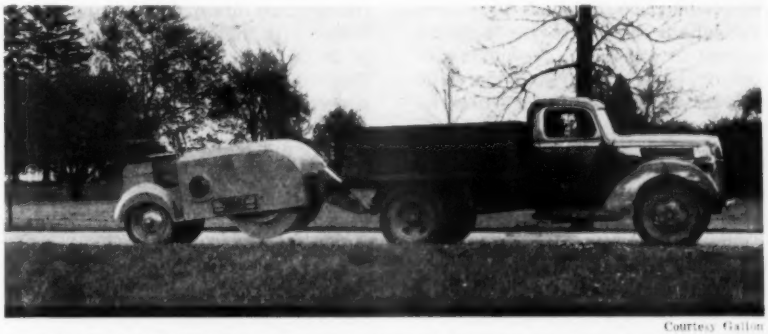
Before the application of a surface treatment all holes should be patched at least two weeks in advance. At the same time large depressions and sags should be built up to grade. In locations where drainage difficulties have been encountered, provision should be made to carry off the water. Next, badly cracked or open areas should be paint patched using a minimum amount of bitumen.

Immediately prior to the treatment the entire surface should be thoroughly broomed preferably with a power broom. All curbs and structures close to the edge of the road should be covered with a protective paper. All structures within or immediately adjacent to the treatment such as manhole covers, catch basin grates, and valve boxes, should also be covered.

There are three basic types of surface treatments: the single application or seal coat treatment; the double or armor coat treatment; and the drag or retread treatment.

In the single application treatment the quantity of bitumen varies from 0.2 to 0.4 gallon per square yard depending on the texture of the surface. From 20 to 40 pounds per square yard of cover stone should be applied immediately with a chip spreader. If the cover stone is not going on uniformly, light brooming should follow the spreader. Where the cover stone is sparse or there appears to be an excess of bitumen, a spotting crew with a light truck should cover and broom to eliminate fat spots. Next, the surface is rolled with a light or medium weight roller taking care not to break up or powder the mineral aggregate, especially if soft stone is used. The roller is not usually necessary on sand cover treatments. Traffic should be kept off the treatment until the solvents have evaporated. Then an effort should be made to hold down the speed of vehicles for three or four hours. If rain falls during the treatment it should be closed off to traffic.

One method which produces an excellent texture is as follows: After preparing the surface as described in other treatments, 0.3 gallon per square yard of RC-5 or 0.2 gallon of SC-5 is applied and covered with 27 pounds of ¾" stone. On top of this 8 pounds per square yard of ½" stone is spread to fill the voids in the larger stone. After a thorough rolling, the surface can be opened to traffic in 4 or 5 hours. Pre-treated stone, which will be described below, is recommended for this type of treatment.



Courtesy Galion

● ***LIGHT PORTABLE roller, easily towed from job to job, is practically an essential for patching and other light maintenance.***

For the double surface treatment the same preliminary steps are taken as for the single treatment. Usually ¾" stone is used as a cover over the first application of bitumen and rolled lightly. After this another application of bitumen is applied and covered with ½" keystone.

The retread or drag treatment is usually applied to worn out, rough or weakened surfaces. There are many variations in this method depending on the type of bitumen and size of stone chosen. In general, the bituminous mat, mineral aggregate and bitumen are placed on the pre-

pared surface and then bladed or dragged and rolled. Best results are obtained with a medium viscosity material.

Maintenance of Joints and Cracks

Joint and crack filling should be done in the late fall in order to insure the sealing out of moisture through the winter and the spring. All foreign matter including inert joint filler should be removed. Extruded material from previous operations and spalled concrete should also be removed and the joint or crack prepared so as to provide a proper seal and allow for expansion of the concrete slab. Asphaltic joint filler of 60-70 penetration is commonly used although there are many accepted sealing materials and compounds on the market. A hand pouring pot or a special machine is used. Openings between the concrete slab and bituminous pavements should also be sealed. Throughout this operation it should be kept in mind that the main purpose is to seal out surface water in order to prevent future deterioration.

Patching and Surface Treatment of Concrete Surfaces

Throughout this article we have recommended patching with the same material in order to preserve the appearance of the surface. Patching with cement concrete, however, is expensive and should be done only when the full depth of slab is removed—or at least a sufficient depth to obtain a proper bond.

A good bituminous concrete mix, well compacted, with the edges feathered, will provide a good riding patch but, of course, the appearance of the surface will be affected. A special mixture of portland cement, asphalt emulsion and sand has been tried with some success.

Any of the methods described under surface treatment of bituminous surfaces may also be used on cement concrete surfaces. Care should be taken to remove loose patches in areas where the concrete surface is disintegrated.

Raising Concrete Slabs

There are two general methods of filling voids under concrete pavements to correct settlement or retard pumping at joints; one is by mudjacking and the other is applying asphalt under pressure. The mudjacking method is the more common. A machine is used which mixes and pumps 260 cubic feet per hour at a maximum pressure of 250 pounds per square inch. The material is a mixture of loam, cement and water with the cement approximately 20 per cent by weight of the soil. The loam should contain a low percentage of sand and clay. The amount of water will vary depending on the moisture content of the soil. The mixture is sometimes called a slurry because it is very thin and flows uniformly under the pavement to fill small voids. A good mix has the consistency of cream.

On two-lane roads, two rows of holes 2 inches in diameter are drilled through the concrete; one row is spaced 3 feet from the outside edge of the slab and one row 2 feet from the inside edge. On the inside lanes of roads consisting of three or more lanes, the rows are spaced 2 feet from each edge of the slab. The holes are spaced about 6 feet apart and are staggered with the holes in the opposite row in order to avoid cracking of the slab.

In raising a dipped slab the slurry should be placed under the center first, until it starts to raise, and then moved toward both ends alternately. Cracks and joints should be watched very carefully during the jacking and the nozzle removed as soon as movement starts. A tapered wooden plug is inserted in the hole in order to prevent run back of the mixture. After the entire slab is raised a mixture of dry loam and cement is tamped in the holes. Moisture from the slurry will seep through this soil-cement plug and cause it to set. If the pavement is not to be resurfaced these holes should be drilled out to a depth of 2 inches after a few weeks and filled with a densely graded mix and thoroughly compacted.

Asphalt subsealing is usually more costly than mudjacking. It is, however, practical where pumping cracks or joints exist and where there is a stable foundation. On two lane roads, 1¾-inch holes are drilled through the concrete 5 feet from the transverse joint and 3 feet from each edge and one hole for observation in the center of the slab. A special grade of asphalt (AASHO M18-42) is pumped from a regular pressure distributor at a temperature of from 350° to 400° F. A nozzle equipped with a three-way valve is placed in the hole which is first blown out with compressed air. Water is sprinkled around the hole in order to chill escaping asphalt. Should asphalt extrude from a crack or joint, water may be sprinkled over the asphalt and the pumping stopped for a minute and then started again. The chilled asphalt is easily scraped off the pavement

Special safety precautions must be taken in this operation. All hands should be protected with asbestos gloves and the men on the nozzle should wear wooden platform shoes and an asbestos hood.

Pretreated Stone Aggregate

The treatment of stone by spraying with kerosene or fuel oil assists in removing the dust film on the aggregate and aids the bitumen in penetrating the pores of the aggregate. Such treatment will not overcome the harmful effects of wet aggregate, or of a rainfall before the binder has had an opportunity to set. Oil treatments therefore cannot be considered as anti-stripping agents. There are a number of use-

(Continued on page 37)

Courtesy Kinney

● ***PRESSURE DISTRIBUTOR should be available to section maintenance crew. Drainage and patching should precede surface treatment.***

PERSONAL EXPERIENCES IN

BIO-FILTER PLANT OPERATION

JOHN LAWRENCE, Supt. of Public Works, and
HARRY EICHENAUER, Operator, Sewage Treatment Plant, Liberty, N. Y.

THOUGH Liberty is a summer resort, there is little variation between average winter and summer sewage flows. For instance, average flow for the first three months of 1948 was 0.70 gpd, and for July and August—the peak of our summer season—1.1 mgd. In taking these averages, all unusually high storm flows were neglected. Though it may be considered surprising that the average monthly flow varies only about 50% between winter and summer, we believe this is due to the fact that nearly all buildings within the Village are now occupied all year and the increase between winter and summer populations is due to hotels and rooming houses. Even this increase is not as great as formerly. The Grossinger, our largest hotel, has an average winter population of 600 and a summer maximum of 1,200.

The primary settling tanks are rectangular and are equipped with Link-Belt collectors. These were constructed in 1931 and have been in continuous operation ever since. The electric motors have not had any repairs or replacements in these 18 years. The chains were replaced in 1948, but prior to replacement, no repairs or attention had been necessary. Continuous operation prevents ice formation in the winter.

Though overloaded, due to recirculation, the primary tanks have performed well and the average reduction in BOD and suspended solids has not varied much from 50% throughout the years.

The filters were put into operation in the summer of 1940 and have given excellent results ever since. During the first winter of operation, recirculation was discontinued, and on very cold nights, when the siphon cut off, the distributors would stop and would not start again. Ice would then form along the arms and on top of the stone. A 2-hour job would then be required to remove the ice and restart the distributor. Also, on cold windy nights, the wind would stop the distributor, permitting ice to form with the same resulting trouble. Beginning in the winter of 1942-43, the primary filter was operated as a low rate filter while sewage was recirculated to the secondary filter. This remedied our ice troubles.

Courtesy The Dorr Co.

● ***TWO-STAGE BIOFILTER, foreground; secondary clarifier and magnetite filter in rear. Other plant units, described in text, not shown here.***

Both filters start to unload between the first and fifteenth of May each year, with some, but rather slight, deterioration of the effluent. Tests in 1942 and 1944 showed the final effluent during unloading to average 23 ppm BOD and 22 ppm SS; while after unloading was completed, BOD averaged 7 to 8 and SS about 10.

The filters are octagonal; we would prefer that they be circular for two reasons: First, filter flies breed more freely in the unused corners; and, second, ice forms in these corners, especially when there is any appreciable amount of snow. Even though filter flies are very noticeable around the filter and siphon chamber, they are not much of an annoyance since they rarely get as far as the office building about 200 ft. away.

We get a greater BOD reduction through the primary filter, which has 2½-inch stone, than we do through the secondary filter with 1½-inch stone. With the filters running in parallel, tests over a 3-month period showed an average BOD of 80 from the primary filter and of 128 from the secondary filter.

Secondary Clarifier and Effluent Filter

The secondary clarifier, which is circular and equipped with Dorr mechanism, has been running continuously since 1940, with no mechanical trouble. Overloading of this unit by very strong sewage or by storm flows does not seem to cut down its effectiveness. However, overloading of the digester, with consequent strong and heavy supernatant discharge, did interfere with its operation. Normally, the BOD of the effluent of the secondary clarifier is about 20, but with an overloaded digester, this has reached 50 ppm. Construction of a new digester in late 1948 has remedied our former troubles in this respect.

Our effluent filter is a magnetite filter. It is usually started about May 15 each year and shut off about Nov. 1, but it could be run the en-

(Continued on page 36)

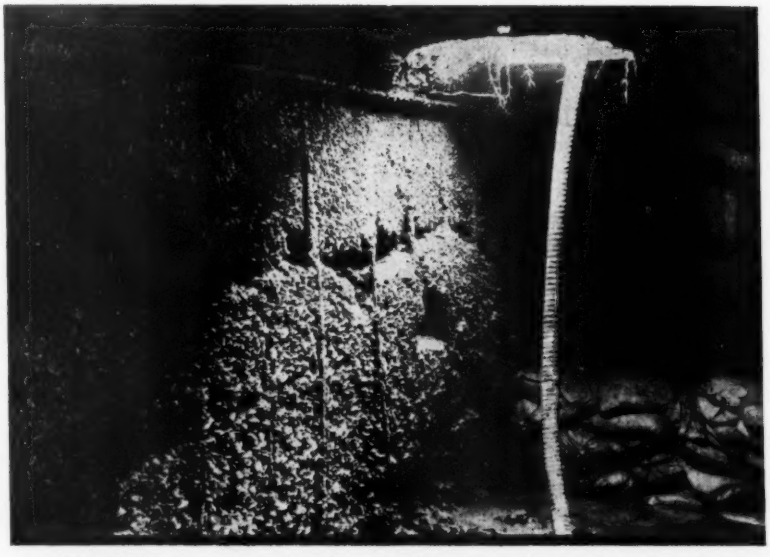
GUNITE

D. D. HANKINS
City Engineer, Savannah, Ga.

BLOCKED on the north by the Savannah River, the growth of Savannah has been to the south residentially and to the west industrially. On account of the low terrain, drainage into the Savannah River was originally by open ditches. The largest of these, the Fell Street Canal, was enclosed in 1917 with a reinforced concrete box culvert 4700 ft. long, varying in cross-section from 7' x 5.5' to 10' x 6.5'. As a matter of historical interest, the concrete in this structure, less steel, cost $9 per cubic yard and reinforcing steel 3.6¢ per pound. The River has a tidal rise of about 6 ft. at the outlet of the sewer, so a tide gate was necessary, and this cost $383.

Industrial wastes discharged into this sewer affected it seriously. Fertilizer plant wastes contain a high percentage of acid; on one occasion, it is reported that, due to a plant breakdown, two carloads of raw sulphuric acid were discharged into the sewer. The side walls were damaged to a depth of one-half inch to an inch. The top was not affected and the bottom, which was covered with a deposit of silt, did not appear to be damaged upon inspection. Etching of the concrete, resembling honeycomb, was more severe near the inlet of the line from the fertilizer plants. Inflow from the river through the poorly fitting tide gate, causing reverse flow in the sewer, tended to dilute the acid inflow, so that damage diminished toward the river.

It is probable that defects in the original construction also contributed to the damage. It appeared that the ground had not been properly dewatered during the period required for the setting of the concrete, allowing water to seep through and wash out cement particles. As a result of all these conditions, some sections of the sewer caved in; the box failed entirely for a distance of 400 ft. and an open ditch was dug alongside the sewer in order to carry the flow of sewage. This created a serious health problem as numerous housing units had been erected in this area.



● ***INTERIOR of sewer, showing etching by acid wastes. Opening in top, sandbag dam and pump suction were preliminaries to beginning repair.***

Solving the Repair Problem

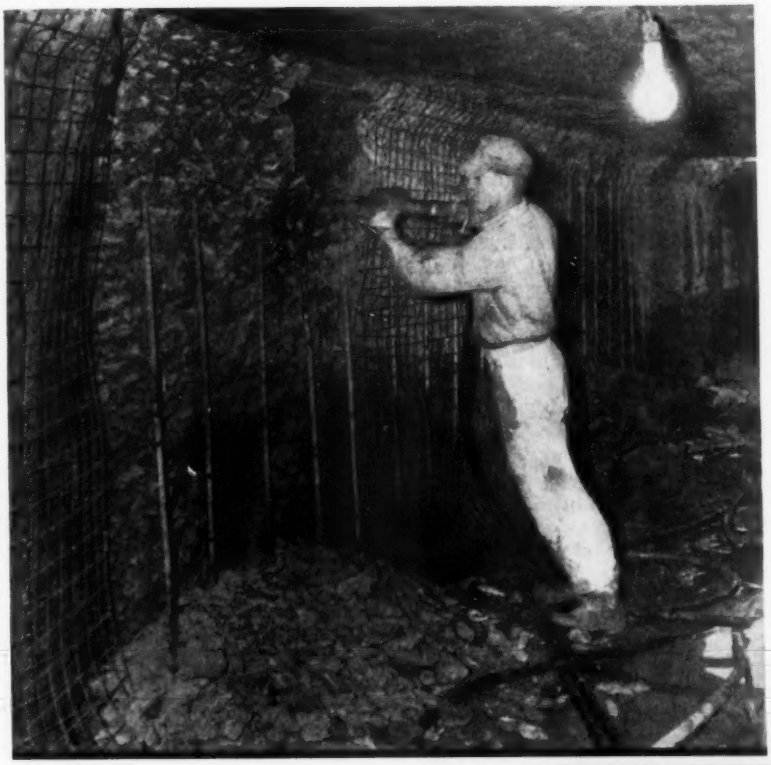
Wiedeman and Singleton, consulting engineers of Atlanta, with Thomas and Hutton, consulting engineers of Savannah, were retained to make an overall study of the city drainage problems. The Fell Street sewer was studied extensively. Because of defects in the tide gate, inspection could be made for only about two hours each day during low tide stage. Extreme high tide was two feet above the top of the sewer. The presence of sewer gas necessitated cutting manholes for ventilation at spacings of 250 to 300 feet. The fact that sediment was several feet deep, in places, prevented close examination of the damage and made an accurate estimate almost impossible.

In consultation with engineers experienced in the placement of pressure concrete, it was determined that repairs by guniting would be feasible, provided the structure were thoroughly cleaned and all loose concrete cut away. The 400-ft. section that had failed would have to be rebuilt entirely and a new flood gate installed. The total cost was placed at $450,000; $150,000 was available and it was estimated that the necessary work could be done for this amount, eliminating repairs on the first 1200 ft. immediately south of the river, which was in fairly good condition. Accordingly, plans were prepared and the contract let in Nov., 1948.

Contract Prices; Construction

The low bidder was Dixie Construction Co. of Savannah at $112,783; the only other bid was $121,710. In the contract, special

Saves Money on SEWER REPAIR



REMOVING the etched portions of the interior with an air hammer to provide foundation for the Gunite.

provisions required that the pressure concrete work be done by skilled and experienced operators. Items involved in the contract included the following:

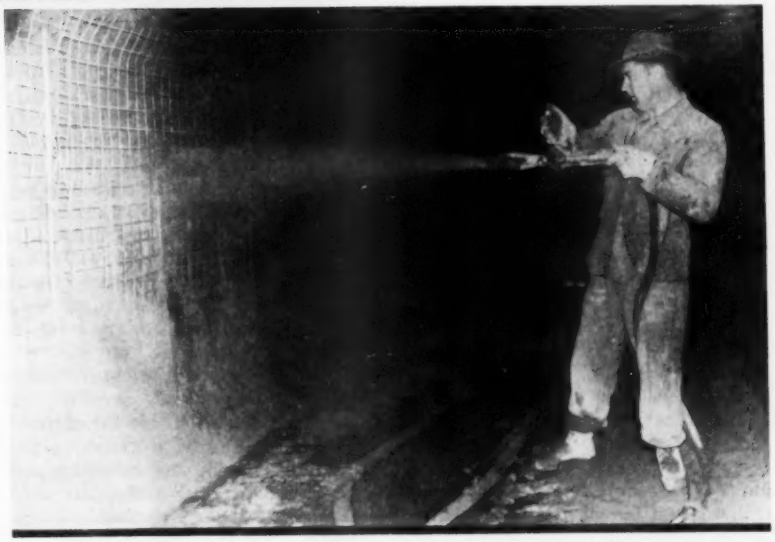
For dewatering, the lump sum bid was $15,370; for constructing the new 400-ft. section of the sewer, the bid was $86 per foot of completed section; for placing gunite, 4,850 batches, the bid was $7.60; the lump sum bid for cleaning the culvert was $9,000. The time for completing the work was 150 days.

Work began Dec. 1 and the job was completed early this summer. The Pressure Concrete Co. of Florence, Ala., was sub-contractor for the gunite work. It was found that the sewer was in worse condition than was expected; as previously noted, complete inspection had been impossible under the conditions. Therefore, an additional appropriation of $50,000 was required. However, the total cost of $163,000 was far less than it would have cost for complete replacement.

The gunite mix was one part cement to two parts sand, with each batch figuring 1.67 cu. ft. Gunite was applied in two courses, with the first course serving as a base course. Each course was approximately 1 inch thick, but additional material was applied at the base of the wall fillet to increase stability.

It is believed that, after these repairs, the sewer will be good for another 30 years or more of service.

Arrangements have been made with the chemical plants to provide another outlet to the Savannah River so that the acid discharges will not cause further damage. Also, an ordinance is being prepared to require that industrial plants must neutralize acid or other harmful wastes before discharge into city sewers.



● ***GUNITING the interior. This shows how the inside of the sewer was built up with a lining of sand and cement. Note fillet at bottom.***

METHODS FOR SUBGRADE TREATMENT AND DRAINAGE

H. A. SULLIVAN
County Engineer, Traverse County, Minn.

FOR many years, parts of State Aid Road No. 3, located in the Village of Browns Valley, were impassable during the spring break-up. Bids for the improvement of 3,500 ft. of this road were called late in 1947 by Traverse County, Minn. Bids were to be submitted for the rental of one (or more) tractor and scraper and one (or more) bulldozer, the bid price to include operators. Estimated equipment hours were 125 for tractor and scraper and 75 for bulldozer.

The work contemplated consisted of the removal of inadequate wood culverts and their replacement with new pipe arch type metal culverts; removal of 1′ to 2′ of objectionable subgrade material; and disposal of the material. The backfill of selected material was under a separate contract.

Only one bid was received, that of Wolters and Layden, of Browns Valley. Their bid of $12.50 per hour for Caterpillar D8 and 14- to 17-yard scraper, and $8 50 per hour for Caterpillar D7 and bulldozer was accepted.

The County furnished the labor necessary to install the arch pipe culverts required at the cross streets and private drives. Two sizes of pipe were used, 18″ in diameter by 11″ rise, and 22″ in diameter by 13″ rise. This pipe was furnished by the Armco Metal Products Company of Minneapolis, Minnesota.

During the progress of the work it was necessary in places to excavate to a depth greater than two feet in order to remove all of the objectionable material. The disposal of this unwanted material did not constitute much of a problem as many of the local residents had low lots where the material could be placed to a good advantage. Many hundreds of yards were placed on a low spot within the right-of-way of the Great Northern Railroad adjacent to our street. The leveling of this waste material was accomplished by our County owned Caterpillar No. 12 Motor Patrol. Places for disposal were selected to permit the shortest haul.

The removal of the subgrade on the south portion of the project presented no problem in either the removal or disposal of the material but this was not the case for the portion on the north side. Large boulders up to two cubic yards in size, were encountered there, and many of them. Obviously, the equipment at our disposal was unable to load these boulders into trucks for removal. The bulldozer was able only to remove the rocks and doze them into piles off the roadway.

A sewer construction project in progress on several portions of our street was also troubled by rock. An agreement was reached with the contractor on that job to load and haul the largest boulders, using his dragline, while our project would take care of the smaller rock. This agreement proved very satisfactory to both parties concerned.

As a complete survey of the road had been made before any work began, we had elevations of the sidewalks running parallel to our road. The sidewalks were very uneven but an average was taken and a grade line set. No curb and gutter is contemplated in the near future, but our design assumed curb and gutter to be in place so that no decided change would have to be made in the road ditches in the event that the curb and gutter were to be installed.

Upon completion of the excavation of the unsuitable material, which was a saturated blue clay gumbo soil, preparations were made to backfill with selected gravel. The gravel pit to be used was located within the village limits. It was not necessary to screen the material from this pit. It required 3,860 yards of gravel to bring the roadway up to grade. A problem presented itself here in that the gravel used contained very little binder and it was difficult for traffic to negotiate the road. This problem was solved by hauling in gravel from another pit eight miles distant. The latter pit contained gravel with suitable binder material. In this pit screening was required. We knew, from past experience, that this material would set-up almost immediately. After placing a wearing course of 934 yards, traffic was able to use the street without difficulty. Spreading and shaping the roadway was accomplished with our own motor patrol.

Total cost of the project including culverts, excavation, backfill and equipment rental charge for our own patrol was slightly in excess of $4,000. This spring no break-up was discernible, whereas in the past years the street became impassable in the spring when the frost left.

Since the road had satisfactorily withstood the winter without break-up, it was decided this spring to place a bituminous mat on the street. We obtained the aggregate from the pit in the village and use SC3 Road Oil. The cost of this mat was $3,500, which price also included some extra work for the village and street intersections and on a side street adjacent to the village hospital. The width of the finished mat is 24 feet in the residential district, widening out to 54 feet in the four city blocks comprising the business section.

Where our road crossed the Great Northern Railroad Tracks a very rough crossing has now been changed to a smooth, level crossing. In listening to comment on the road, it is this crossing that comes in for praise.

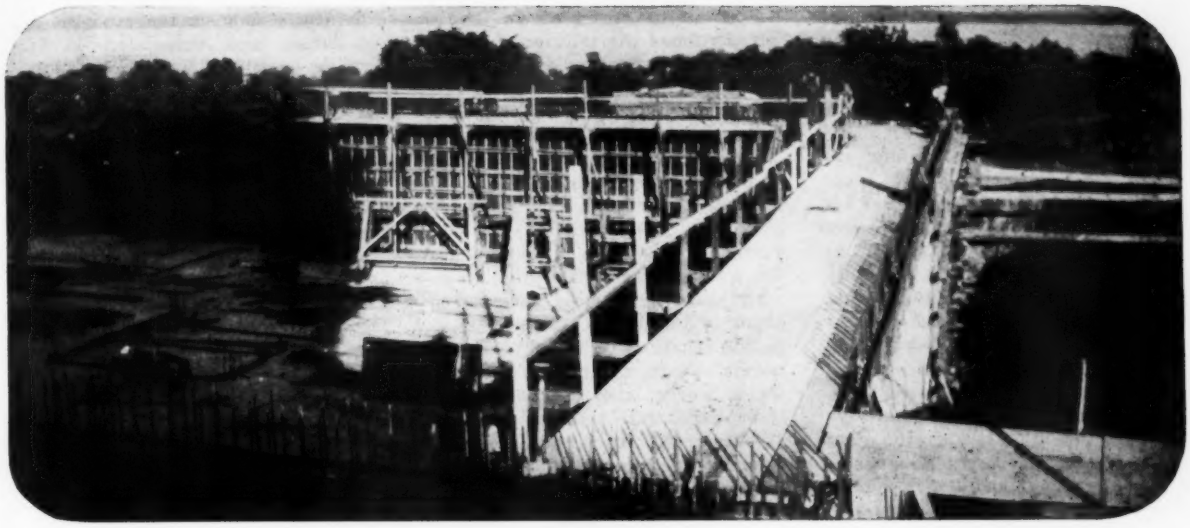
Temporary Sewage Treatment

(Continued from page 20)

mate disposal of the final effluent is into Addison Creek via a drainage ditch. Retention in the final tank is 1.69 hours. Removal of secondary sludge is, as previously mentioned, accomplished by continuous withdrawal back to the raw sewage sump. This area is very flat and the ground surrounding the school is drained by the use of subsurface collector lines of tile pipe discharging into the ditch receiving the effluent from the sewage treatment plant.

The disposal of digested sludge is by a standard-type sludge drying bed 18′0″ by 10′0″, 180 square feet in area. Media consists of 6″ of clean, washed sand covering 6″ of graded gravel, varying from 2″ around the underdrain to ¼″ at the underside of the sand layer. Filtrate collection is by a 4″ vitrified tile underdrain system, with the filtrate returned to the raw sewage pump basin through a closed vitrified tile line. To date no digested sludge has been drawn. Last winter, due to improper cover, the 4″ C.I. sludge drawoff valve froze, cracked, and had to be brazed. Plans, however, called for proper cover with a 12″ vitrified tile extension stem casing.

In order to protect the school children, the plant is surrounded by an 8′ high cyclone-type fence. Excluding the protective fencing, the small house built over the pumping unit, and the proposed filter housing, the cost of the installation is approximately 100% more than a septic tank installation of equivalent size.



HOW WE BUILT A RESERVOIR BY FORCE ACCOUNT

PETER G. PERLA
Ass't City Engineer, Traverse City, Mich.

A 1,300,000 gallon reinforced concrete water reservoir has recently been completed and placed in operation by Traverse City, Michigan, the Nation's Cherry Capitol. The structure is buried in a side-hill at the west city limits, 150 feet above Lake Michigan's Grand Traverse Bay, source of the city's water supply. The reservoir is 90 feet wide by 135 feet long by 15 feet deep, inside dimensions. The north end floor is one foot higher than the south end, giving a slope of 1:135 for drainage purposes. Walls are 15 inches thick, the floor slab 10½ inches thick, and the roof slab 8 inches thick. Columns supporting the roof are 14 inches square with 3½-ft. square capitals, and placed on a 15-ft. grid. In the roof are four 10" diameter vents; and two 6-ft. by 4-ft. manholes. On top of the roof is a system of 4-inch open joint tile drains and a dirt fill 18 inches deep. A 10-ft. by 10-ft. by 11-ft. valve pit is located 30 ft. from a corner of the tank. A 16-inch cast iron pipe feeder main connects the valve pit with the city water works and a distribution system, with a 12-inch inlet pipe and a 16-inch outlet pipe tying the reservoir to the system through the valve pit.

The site chosen has several outstanding advantages for a reservoir: It has the highest elevation of any point in the city, and is 25 ft. above the highest point in the distribution system; it is only about a mile from the city's water works; it is readily accessible from an existing city street; the land had a low real estate value; it is near a well populated section of the city; and it was necessary to install only about 3,200 ft. of 16-in. main to connect the reservoir to an existing feeder main from the water works.

Beginning Construction Work

Construction was begun in July 1947, following the installation of the 16-in. feeder main. A special construction crew consisting of a foreman, several carpenters, and several laborers was engaged by the city for the project. Additional laborers were obtained from the city water department to assist with concrete pours and handling of materials. A dragline and a bulldozer were hired on an hourly basis from local men to do the excavating and the back filling. The excavation was accomplished in good time. There was ample space for the dirt on three sides, and with one minor exception, only sand and fine gravel were encountered below the overburden. A pocket of clay in one corner of the site, slightly above the established grade for the bottom of the excavation, made it necessary to use the air compressor to break up the clay so it could be removed with the dragline.

Pouring the Concrete

After fine grading a 2-inch mud slab was poured, upon which the floor slab steel was placed. The floor slab was poured in nine sections, the construction joints being in the center of the bays between columns in both directions. Floor slab pours ran from 33 to 57 cubic yards. The walls were poured to a 13½-ft. height, ¼ the perimeter at a time. These were the biggest pours of the job—about 70 yards each. A vibrator was used on all concrete placed in the walls. A system of falsework and a floor to support the roof slab concrete was next constructed, over the entire area of the reservoir. The columns were poured from this floor up to the line for the capitals, and all of the roof slab steel was placed before operations were suspended due to cold weather. Upon resumption of work in the spring of 1948 the roof slab and capitals were poured monolithically, again in nine pours. Pouring of the manhole walls and the valve pit completed the concrete work.

All concrete was mixed with a 11-S mixer, a mix of 6 sacks per cubic yard being used throughout, with the exception of the mud slab. A dispersing agent, Pozzolith, was

used in the concrete, and the aggregates were locally processed sand and gravel. The mixer was set up on the down hill side of the reservoir for the floor pours, and on the south end for all the other pours. By so doing, up-hill wheeling was eliminated. Due to limited space available for storing cement and aggregate at the site, it was impracticable to schedule pours on consecutive days. Also some uncertainty existed in the aggregate supply and cement delivery dates. The comparatively small number of workmen employed proved to be entirely adequate under the existing conditions. After each pour there was always enough work to do to keep the crew busy for a day or more getting ready for subsequent pours. Both dragline and dozer were used for back filling and sloping the sides of the reservoir. Workmen using wheelbarrows made the 18-inch fill on top of the reservoir, assisted by the dragline which piled dirt around the perimeter. A total of 1240 cubic yards of concrete and 47.5 tons of reinforcing steel was used for the reservoir and valve pit.

Water department workmen installed the necessary pipes and valves in the reservoir and valve pit, scrubbed the interior of the reservoir and sterilized it with chlorine solution. The altitude control valve was set to keep the high water level 6 inches from the top of the tank. The reservoir was placed in operation in August, 1948. Levelling off of the pumping peaks was immediately noticed, as was expected. Formerly hourly pumping at the water works during the high demand summer months varied from a low of 1.0 million gallons daily to peak periods of 12 m.g.d. Now the normal 60-pound pressure at the water works is maintained during the summer with a pumping rate of 4 to 8 m.g.d. In a normal day of summer operation it was observed that the reservoir filled up at night, and that the water level dropped about 12 feet by night fall.

Plans for the reservoir project were initiated by city manager C. A. Miller in 1943, when Shoecraft, Drury, and McNamee, consulting engineers, were engaged to make a study of the city's water supply system. Wartime and post-war shortages, particularly of cast iron pipe, necessitated the delay in starting the project. Delivery of the 16" feeder main was made in 1947 and the installation was completed in the spring of 1948. Installation of this main and of the control equipment at the reservoir, and the cleaning and sterilization of the tank was done under the supervision of Tony Eikey, superintendent of the city water department. J. A. Rowley, city engineer, supervised the construction work and furnished the necessary engineering services, assisted by the writer, and Mr. Weggel and Mr. Fetters of the consulting engineer firm.

Order of the Boar to Meet at APHA

Under the direction of Col. J. J. Gilbert and Col. F. B. Elder, a dinner meeting and initiation of the Order of the Boar will be held during the American Public Health Association meeting in New York in October. Fuller information regarding the meeting will appear in the news letter of the Engineering Section, APHA. In general, attendance will be restricted to invited guests and former officers of the Sanitary Corps of the Army.

● ***EXCAVATION** completed, floor leveled and reinforcing in place, ready to pour the floor.*

● ***PORTION** of the wall has been poured and forms stripped, preparatory to placing another section.*

● ***METHOD** of handling concrete for floor sections, using rubber tired concrete cart on movable runway.*

● ***FORMS IN PLACE** and section of wall being poured. Steel for footings and columns is also in place.*

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5. The Dorr Clarifier
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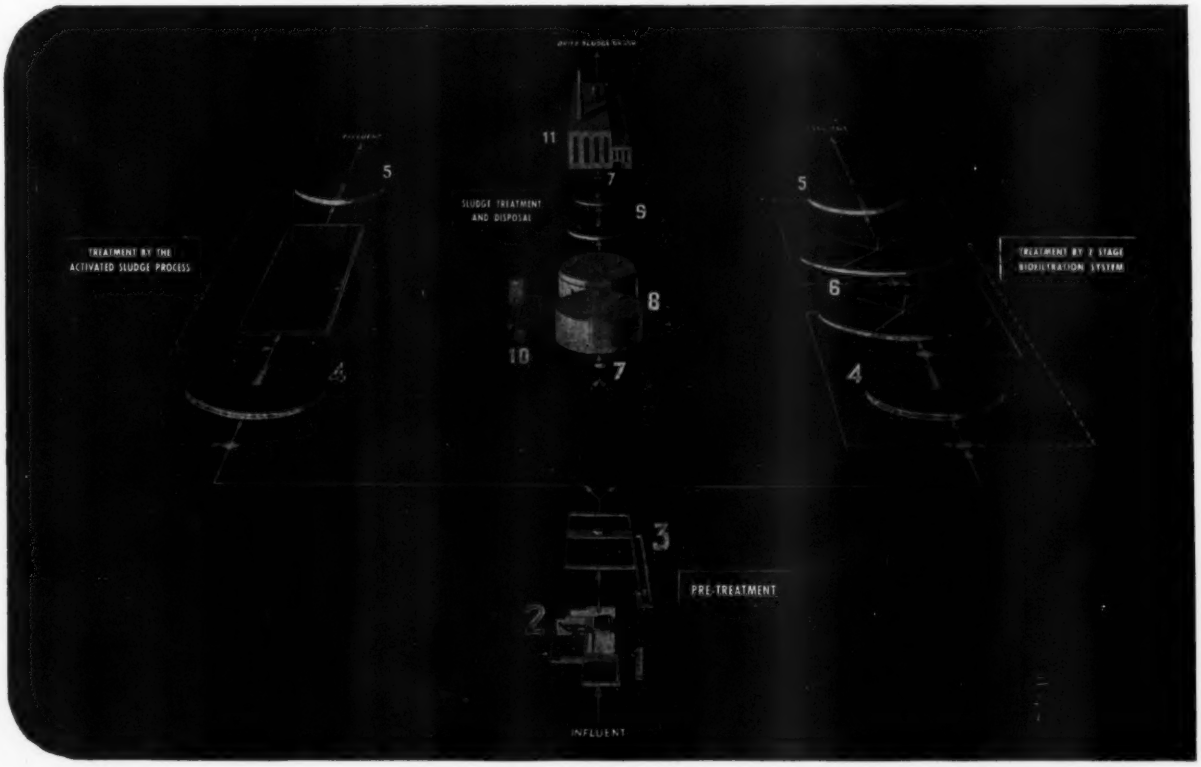
8. The Dorr Multdigestion System
* The Dorr Digester
9. The Dorr Thickener
10. The Spiral Heat Exchanger
11. The C-E Raymond System
(sludge drying/incineration)

● **FOR COMBINATION TREATMENT**

* The Dorr Duo-Clarifier
(primary and secondary clarification)
* The Dorrco Duo-Filter
(primary and secondary filtration)
* The Dorrco Clariflocculator
(flocculation and clarification)
* The Dorr Clarigester
(clarification and digestion)
* The Currie Claraetor
(aeration and clarification)
* The Dorrco Vacuator
(for grit, scum and solids removal)

* Alternative or combination units not shown on composite drawing.



If you do not already have information on all the Dorr units shown in the composite flowsheet above, write for your copy of "Dorr Equipment and Methods" . . . 12 pages of photos and descriptions covering every unit in the Dorr line.

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When you need special information—consult the **READERS' SERVICE DEPT.** *on pages 65-69*

Houston Water Supply

(Continued from page 21)

outside the city limits, and therefore not governed by the city plumbing code and inspection system, was deemed to create a potential hazard to the water system. Therefore, early in the year, a policy was adopted requiring the approval of the sanitary engineer before such services could be connected. This work resulted in 173 surveys of properties outside the city limits.

Of the cross-connections eliminated, as indicated previously in this section, 10 were with private wells; 3 with circulating water; and 3 with sewers.

In addition to numerous chemical analyses and 11,186 bacteriological examinations, a study was made of the suds-forming abilities of various washing compounds in typical Houston water having a chloride content and hardness of about 50 ppm. This study resulted from a complaint by a distributor of washing machines that Houston water was responsible for the failure of soaps to wash clothes satisfactorily. A total of 26 soaps and detergents were tested. It was found there were marked variations in the amounts of the different washing powders neccessary to produce a lather.

Another washing machine distributor blamed the Houston water for causing small round, precisely separated rust-colored spots to appear on the clothes washed. Since analyses showed an exceedingly small amount of iron present in the water, a further examination of the washing machine was made. This showed that the machine was so designed as to be an excellent aerator, precipitating iron oxide in a few seconds of use.

During April and May, growths of water lilies, water shield, cattail, pondweed and some arrowhead appeared in the north end of Sheldon Reservoir. These areas were sprayed by plane with an aqueous solution of 2,4D during May, with generally satisfactory results. Hand sprayers were also used with several different carrying agents for the 2,4D. A new product, Esteron 245, was used on an experimental basis. General observations indicate that the control of undesirable plant growths by such chemicals over large areas of impounded water is feasible and economically justifiable when the treatment can be applied by airplane.

AROUND THE CLOCK CONTROL

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BUILDERS PROVIDENCE Instruments

When writing, we will appreciate your mentioning PUBLIC WORKS

Operating a Biofilter

(Continued from page 29)

tire year if needed. We have had no mechanical troubles with it; about half a barrel of magnetic sand is added every other year. This unit is really indispensable. It can be relied on to effect a sizable reduction in BOD regardless of the strength of the sewage that comes to it. For example, during 1948, when the plant was badly overloaded with sludge overflows from the digester, the magnetite filter gave the following average reductions: BOD from 56 to 14; SS from 71 to 12. More normal conditions are represented by 1944 data, when the following reductions were accomplished: BOD from 16 to 4.9; and SS from 24 to 6. Whenever it is not needed, the unit can be shut off; it can be started at any time and begins to work immediately.

Screen and Grit Chamber

The screen and grit chamber make more work for the operator than any other unit of the plant. The screen operates every 30 minutes during the summer, and by hand switch in the winter. Screen-

ings have been placed in an old settling tank, but with the construction of a new municipal incinerator during 1949, they will be burned. During 1948, for the second time since the screen was installed, the chain came off the cogs. It is a trying job to get the chain back and the unit working.

A new Parshall flume was installed ahead of the screen in 1943. It is intended to install a comminutor at some time in the future and to use our Tritor screen for grit removal only.

Sludge Handling and Disposal

Unheated digestion tanks were replaced in 1940 with a 35-ft. diameter heated digester of 20,000 cu. ft. capacity. This unit began to show signs of overloading in the late summer of 1945, and this condition became increasingly worse until a new digester was built late in 1948 and put into operation this spring. It is our experience that a digester cannot be designed to take care of an overload for any extended period —probably for no more than a month. That is, a weighted design based on average population is undesirable.

After the new digester was put into operation, our old digester was dewatered and examined. It was found to be in excellent condition, and was put back into service. The new digester is 50 ft. in diameter, of prestressed construction and equipped with propeller mixers and removable heat exchangers.

The 35-ft. digester produced 7,000 cu. ft. of gas per day in the winter and 12,000 cu. ft in the summer. This is adequate for heating the digester and the office building.

Two covered sludge drying beds were built in 1931. These had an area of 6,500 sq. ft. This was not enough and, in 1939, a vacuum filter with 50 sq. ft. of area was installed. This operated with varying degrees of success. In 1948 a 150-sq. ft. filter was ordered and is now being installed. When this unit is working properly, it is planned to take down and sell the glass covers.

Operating Costs

One man operates our plant for 9 months of the year; during the three summer months he has a helper. Some additional labor is required to clean the sludge drying beds and for other work. The total labor charge against the plant for 1948, including the operator, was $4,780. The charge for power was $1,800; and for materials and other items $1,000. The average appropriation over the past five years for operation has been $7,500. With wage increases and additional power requirements because of the new units, it is anticipated that the cost of operation will increase to about $8,500 per year.

Pavement Maintenance

(Continued from page 28)

ful anti-stripping compounds on the market, for use in both patching and surface treatment work. Most of these compounds work very well in warm weather and are particularly useful in patching in the spring. In surface treatments, because of the closer adhesion of the asphalt and aggregate, less stone is lost through the action of traffic. Thus the amount of stone may be reduced. Also, in case of a rainstorm occurring during the operation, the asphalt will still adhere to the stone.

The amount of solution applied to the stone is usually from ½% to 1% by weight of the aggregate or about 1½ gallons per ton. Many

A Special Invitation to YOU to Attend the 55th Annual

Technical Sessions, Round Table Discussions and Equipment Clinic

SEPT. 18th to 21st, 1949, at KANSAS CITY, MO.

PUBLIC WORKS CONGRESS and Equipment Show

FROM September 18th to 21st, 1949, in the Municipal Auditorium in Kansas City, Mo., nearly a thousand public works engineers and officials will meet to share ideas and experiences at the 55th annual Public Works Congress and Equipment Show.

This is a cordial invitation for you to come too.

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You will like the practical aspect of the technical sessions. You will find out why many come year after year especially for the renowned round-table discussions. Sessions cover latest practices in street construction and layout, traffic safety, refuse collection and disposal, street cleaning and snow removal and motorized equipment. There will be discussions of personnel problems, public relations for public works departments, planning and other problems.

The equipment clinic is a big feature. This includes displays and demonstrations of latest equipment. You can see many pieces of the latest equipment in operation.

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If you are a city engineer, commissioner of public works, county, state or federal engineer, consultant, contractor, or otherwise employed in public works, this Public Works Congress is planned especially for *you*. There will be entertainment for both you and your wife if you can bring her along. So plan now to come to Kansas City in September.

For further details write today to

AMERICAN PUBLIC WORKS ASSOCIATION

1313 EAST 60th STREET, CHICAGO 37, ILL.

quarries are now able to furnish pretreated stone. If these facilities are not available, one method is to spray the stone with the solution as it is being unloaded from the trucks into a stockpile, using a low pressure machine with a ½-inch hose and a spray nozzle.

Conclusion

There is nothing more annoying to the travelling public than holes in the road surface; and such holes also contribute to accidents. Train your crews to patch them as soon as they develop. A smooth riding highway is a good advertisement for any community.

Charles M. Upham, Engineer-Director of the American Road Builders Association, says: "Maintenance men are the unsung heroes of highway transportation." Too little attention has been paid to the organization and retention of well trained maintenance men in the highway field. Experience is perhaps more important in maintenance than in other branches of the highway organization. This fact should always be kept foremost in the mind of the public official.

In considering replacement vs. reconditioning of a 53 year old line carrying Water to Chula Vista and National City, Calif., the California Water and Telephone Company decided to recondition the line since replacement in addition to the tremendous cost would have meant disturbing many acres of valuable citrus and vegetable fields.

Reconditioning involved a thorough cleaning by National of over 15,000 feet of 24 inch line, after which the entire line was centrilined.

According to information received, the reconditioning has added at least 20 years more of useful life with a marked increase in the volume of water previously handled.

Our engineers will gladly submit facts and figures on how National has solved similar problems for other utilities. Why not write today?

31

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When writing, we will appreciate your mentioning **PUBLIC WORKS**

Recording Chlorine Residuals

A recent report of the Committee on Water Supply of the American Public Health Association contains the following favorable comment on a recently developed piece of equipment. "Ordinarily this committee would not refer to a single example of commercial water purification equipment, but the recent development of the chlorine residual recorder appears to represent an important stage in water chlorination practice. Experience at 14 installations has shown that the chlorine demand of water fluctuates to a more marked degree than is usually realized. In fact, these fluctuations have been correlated at some plants with details of operating control not usually associated with chlorination. Obviously the recorder permits closer control of chlorination within limits producing best results for a given water. The next logical development is the use of this equipment to control the dose of chlorine so as to maintain automatically a uniform concentration of residual chlorine in the treated water. Inasmuch as faulty operation of water purification plants has been found to be the cause of a number of outbreaks of water-borne disease, this development is of distinct public health importance."

Court Rules on Award of Patented Article

THE Supreme Court of Appeals of Virginia has rendered a decision in a case involving the award of incinerator contracts by Arlington Co., Va., and has upheld the previous judgment of the Circuit Court. In August 1948, bids were received on a 300-ton municipal refuse incinerator with alternates on hand and mechanically stoked types. The contract was awarded to the higher of the two bidders on the mechanically stoked type of furnace and the suit was based on this award. Some of the points discussed in the judgment by the court are of broad interest, and are quoted or abstracted herewith.

"The County had a clear right to frame its specifications to permit it to buy a mechanically stoked furnace if it turned out that it would be in the best interests of the County to do so. The fact that the Nichols mechanical stoker was the only one made, and was patented, did not shut the County off from inviting a bid on that type of stoker. The fact that there could be only one bid for that type did not make com-

petition impossible. It could be and was made to compete with the hand stoked type."

"The question of the availability of a patented article in competitive bidding has frequently arisen in cases where competitive bidding was a statutory requirement. *Hobart* v. *City of Detroit*, 17 Mich. 246, 97 Am. Dec. 185 (opinion of Chief Justice Cooley) is often referred to as a leading case in support of the view that such a statute does not prejudice the use of patented articles. The security of the city against combinations and extravagant contracts in such cases must rest in the power which the common council possesses to reject any bid which they might regard as unreasonable, * * *." (97 Am. Dec. at p. 187).

Under the contrary view, as stated by the Iowa Supreme Court in *Saunders* v. *Iowa City*, 134 Iowa 132, 111 N.W. 529, 9 L.R.A. (N.S.) 932, the court said that public bodies might be prevented from availing themselves of new inventions and required to depend upon the cobblestones of our forefathers. The court added further that what was meant by the statute there under consideration was that "there must be competition where competition is possible. See Anno., 77 A.L.R. 702, where it is said that the weight of authority appears to sustain the right of municipal authorities to designate a patented or monopolized material to be used for public improvements, if it is not the purpose or the effect of the specification to prevent or restrict the competitive bidding required by statute."

"It is urged by the appellants that the County Board had no right to evaluate the bids; first, because no notice of such action was given, and second, the method used was unwarranted. We think neither of these contentions is sound. The specifications specifically reserved to the County the right to reject any or all proposals and to accept the one that in its judgment best served the interests of the County. Such a reservation is generally held to vest in the authorities a wide discretion as to who is the best as well as the lowest bidder . . . and this involves inquiry, investigation, comparison, deliberation and decision, which are quasi-judicial functions, and, when honestly exercised, may not be reviewed by the courts. (43 Am. Jur., Public Works and Contracts, B45, p. 788.)"

"The lowest bid may be determined by monetary standards with the dollar as the unit, but this is not so in determining the 'best' bid, or the 'responsible' bid; that question involves a number of other factors and elements. (43 Am. Jur., Public Works and Contracts, B42, p. 784.) Clearly among the factors so involved are the experience of the bidder in that field, the quality of his previous work and the cost, not alone of constructing what he proposes to build, but of operating it after it is built. . . ."

"When the decision of the authorities is based upon a fair and honest exercise of their discretion, it will not be interfered with by the courts, even if erroneous. Courts do not in such cases substitute their judgment for the judgment of the body to which the decision is confided. Interference by the Courts is limited to cases in which the public body has proceeded illegally or acted arbitrarily or fraudulently."

"We think the County Board had the clear right to consider the bids in the light of the operational cost as well as of the installation costs in ascertaining which bid best served the interests of the County, and that the method of evaluation used to that end was proper."

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These great hydrants give long, trouble-free service because of their simplicity of design and accessibility for service. All working parts are contained in a removable barrel; if replacement is required, as when the hydrant is knocked over by a truck, a spare barrel can be inserted in a few minutes, and without excavating. The stuffing box plate, cast integral with the nozzle section, prevents water and silt from reaching the operating thread. An iron shield guards the bronze revolving nut against rain and dust. Free and quick operation is assured at all times.
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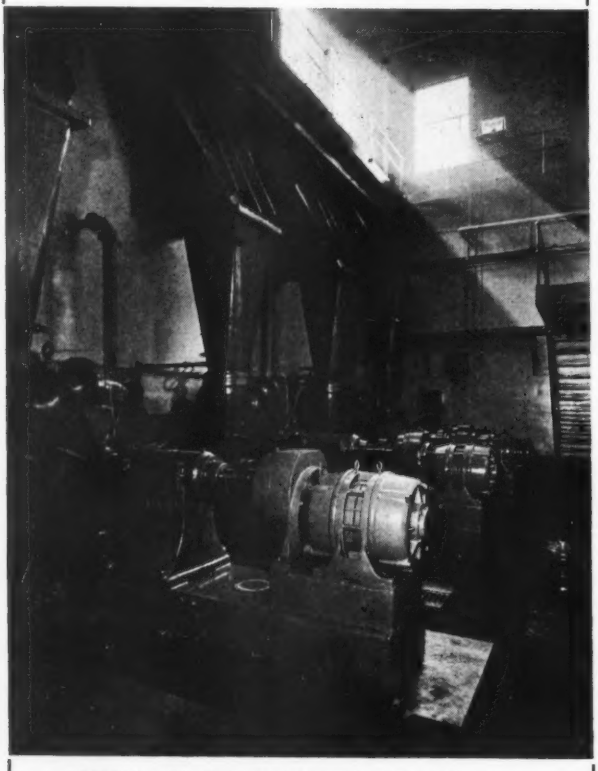
Manufacturers of "Sand Spun" Pipe (centrifugally cast in sand molds) and R. D. Wood Gate Valves

When you need special information—consult the READERS' SERVICE DEPT. *on pages 65-69*

Long-Lasting INERTOL Paint Cuts Plant Upkeep Expenses

INERTOL Enamels Applied 11 Years Ago Still in Tip-Top Shape



PARTIAL VIEW RAHWAY VALLEY SEWAGE PLANT, N. J.

At the Rahway Valley Sewage Plant, New Jersey, Glamortex Machinery Enamel protects stair treads, railings, pipelines, machinery, gate valves, doors, chlorine lines, and structural steel.

According to a recent report from Eric Hartmann, Field Engineer, "Glamortex is thoroughly resisting the oils and greases and withstanding the hard wear. Its glossy finish makes cleaning effortless and really saves time for the operator. The Glamortex colors at the Rahway Sewage Plant are olive green, light grey and black.

"On the floors, walls and ceilings," Mr. Hartmann says, "the Ramuc Utility Enamel reflects plenty of light and reduces the amount of artificial light required. The colors of Ramuc at Rahway are light grey on the walls; and maroon on some floors and medium grey on the others. You can see that Ramuc is unaffected by sewage fumes because it holds its original color and does not turn dark.

"All the paint is still in tip-top shape. The long life of Inertol paints has cut maintenance costs at Rahway, as the plant has not had to be repainted for 11 years."

For the full story ask for "Painting Guide." FREE! Drop a postcard to:

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480 Frelinghuysen Ave., Newark 5, N. J.

19 South Park, San Francisco 7, Calif.

CITY-COUNTY *Public Works* ENGINEERING DATA

Man-Hours of Labor for Mosquito Control Operations

A tremendous program of mosquito control was carried on by the Army in its camps during World War II. Careful records were kept of the amount of each type of work that was done. Following are figures showing the man-hours required for a number of the more common operations:

Clearing and brushing required an average of 63 man-hours of work per acre. In the southeastern part of the country, 72 man-hours per acre were required. Channeling and ditch cleaning required 0.12 man-hour per lineal foot. New ditching, excluding laterals and including only unlined main ditches, 0.63 man-hour per lineal foot. In the southeastern area, 0.73 man-hour per foot was required. For handling dirt, mainly in fills, 2.46 man-hours were required per cubic yard. For water surface treatment, including lakes, ponds and streams more than 5 ft. wide, 14.7 gallons of oil were used per acre of water surface. Per acre of water treatment, including application of paris green, oils and other larvicides, 6.1 man-hours per acre were required.

The malaria rate for soldiers in the United States was reduced 97% as compared to World War I; and, in fact, was brought to a negligible point.

Experience With Reflectorized Traffic Paint

A study has been made by the State Department of Highways of Washington of reflectorized traffic paint as it has been used by the department on its roads. From this it has been concluded that glass beads increase the night visibility of painted traffic stripes to a greater degree than other available materials. Change has been made from the original large size to small beads, as being more economical, having a longer service life, and being adaptable for successful use with a wider variety of paints.

Methods of application also have changed. Originally the beads were spread over the freshly painted stripes, but better results are now obtained by mixing the beads with the paint just prior to application; they are thus distributed in the stripe more uniformly, and continue to be more effective throughout a longer life. Where premixing is not practicable with the striping machines employed, the "fog-coat" method has been used, a second light coating of paint being applied over beads that have been placed by the first

When you need special information—consult the READERS' SERVICE DEPT. on pages 65-69

method. The fog-coat stripe is inferior to the premix in uniformity but results in better bead retention than the original overlay stripe.

Ascertaining Underground Conditions in Planning Sewers

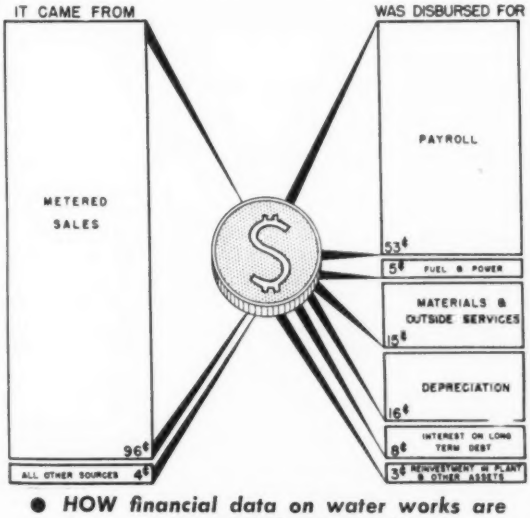
In installing a sewerage system at the Naval Base in Philadelphia the Navy awarded a contract which included 12,000 ft. of 4" to 24" cast-iron pipe and 54,443 ft. of 4" to 36" vitrified pipe. In laying this pipe the contractor encountered foundations and remnants of structures abandoned by the Naval Base during the 80 years of its development. Many of these necessitated rerouting the sewer lines. Up to July 1, 1948, the changes in construction incurred as a result of unforeseen subsurface conditions totaled 100 and involved an additional cost of $50,000 and delayed the work 60 days. It was anticipated that the changes would eventually reach 250, at an additional cost of $150,000 and a delay of 180 days. It would seem as though the subsurface conditions could have been ascertained during the planning at a cost much less than $150,000, and with a delay much less than 180 days in starting and completing the work.

Costs of Repairing of Pipe Breaks

In 1947, Honolulu reported 120 pipe breaks, which cost an average of $93.85 each for repair; in 1948, there were 141 breaks, which cost an average of $138.21 each for repairs. The greater 1948 cost was mainly due to the fact that there were more breaks in large pipes. There were 7 breaks in 16" pipe in 1947 and 6 breaks in 1948; average cost of repair per break in 1947 was $450.05 and in 1948, $469.18. Other 1948 costs for repairing breaks were: 4-inch, 14 breaks, average cost $57.38 each; 6-inch, 40 breaks, average cost, $141.91 each; 8-inch, 9 breaks, average cost $197.83; 12-inch, 5 breaks, average cost, $329.97.

Presenting Municipal Financial Data

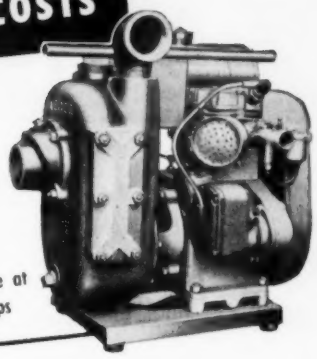
This illustration, reproduced from the 1947-1948 Report of the Board of Water Supply of the City and County of Honolulu, Hawaii, impresses us as a new and pleasing variation on the graphical method of presenting financial details of municipal departments.



● *HOW financial data on water works are presented by Honolulu.*

JAEGER SLASHES PUMPING COSTS

2" aluminum pump with 4 h.p. engine
Pumps 9000 gph
Sure-primes at 25 ft. lift in less than 1 minute
Weighs only 105 lbs.
High head performance at price of low head pumps



The first feather-light pump with big capacity and pressure, armored against wear with stainless steel shell fitting, hardened liner plate and impeller, and long-life Lubri-Seal. Powerful new Wisconsin ABN engine, maintains big volume even at heads well above 100 feet. Two men easily carry its 105 lbs. Also available on cushion or pneumatic tires. Ask your Jaeger distributor or send for Bulletin LP-9 and prices.

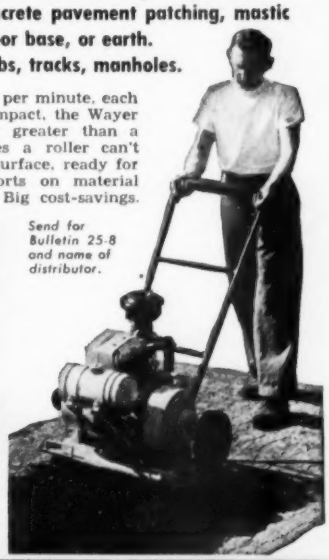
The JAEGER MACHINE Co.
Columbus 16, Ohio
1½" to 10" Dewatering and Pressure Pumps, Jetting Pumps, Diaphragm Pumps
COMPRESSORS • MIXERS • HOISTS • PAVING EQUIPMENT

a "10-TON ROLLER" that weighs only 230 lbs. . . .

Super-tamps, finishes, cures 60 to 80 sq. ft. per minute of bituminous or dry concrete pavement patching, mastic or cement composition floor base, or earth. Works flush to walls, curbs, tracks, manholes.

Striking 1750 to 2000 blows per minute, each of more than 700 ft. lbs. impact, the Wayer Impactor produces density greater than a 10-ton roller and in places a roller can't reach. Heated plate cures surface, ready for immediate traffic. Transports on material truck. One man operates. Big cost-savings.

Send for Bulletin 25-8 and name of distributor.



Can work flush to any edge

WAYER IMPACTOR
Wayer Impactor Sales Co., 12 N. Third St., Columbus 15, Ohio

PUBLIC WORKS DIGESTS

Water Supply page 42

Highways and Airports page 48

Sewerage and Refuse page 52

● *This section digests and briefs the important articles appearing in the periodicals that reached this office prior to the 15th of the previous month. Appended are Bibliographies of all principal articles in these publications.*

THE WATER WORKS DIGEST

Flow Analysis of Pipeline Networks

The author describes a procedure for determining the values of flows and friction head losses in pipeline networks. It involves successive approximations, often only one, seldom more than two. Each successive step involves the solution of a set of simultaneous linear algebraic equations equal in number to the number of effective loops in the network. The number of computations per successive approximation is greater than in the relaxation or Hardy Cross method, but fewer approximations are required and usually one should be sufficient. The author considers this "linear-approximation" method well adapted to the analysis of flows and head losses in networks containing a few loops. Convergence is certain and rapid, and the number of computational operations required is less than that needed in the relaxation method to give the same degree of accuracy from the same original guesses of flow rates.

Malcolm S. McIlroy — "Pipeline Network Flow Analysis Using Ordinary Algebra"; *Am. W. W. Ass'n Jour.*, May.

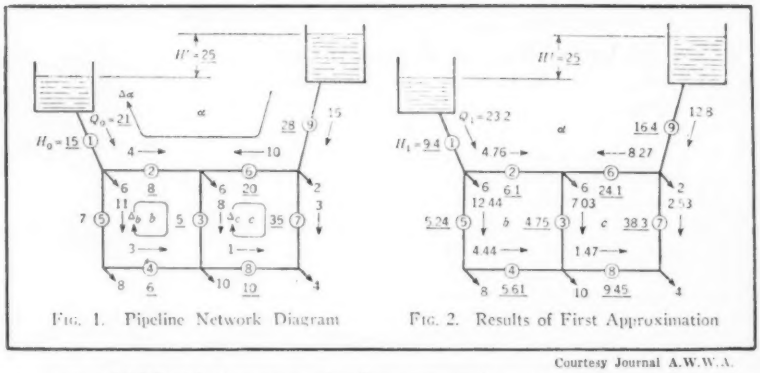


Fig. 1. Pipeline Network Diagram

Fig. 2. Results of First Approximation

Courtesy Journal A.W.W.A.

● ***DIAGRAM showing pipeline network and results of first approximation.***

Haemolytic Organisms In Swimming Pool Water

Study of the presence of haemolytic organisms in 15 swimming pools in the area of San Antonio, Texas, and of the effect of chlorination, was made in 1948. Of pools with an average free chlorine residual of 0.33 ppm, 14% showed the presence of haemolytic organisms and 1.3% showed those of the coliform group. Of samples from pools not chlorinated, 62% showed haemolytic organisms and 15% coliform ones. Some of the conclusions reached were that increasing chlorine residual was more effective in controlling haemolytic than other organisms; that maximum results in controlling haemolytic organisms are reached when the chlorine residual reaches a little over 0.8 ppm, and any excess over this would be superfluous. It was the feeling of the authors that the check for haemolytic organisms in swimming pool water is more important than for coliform organisms.

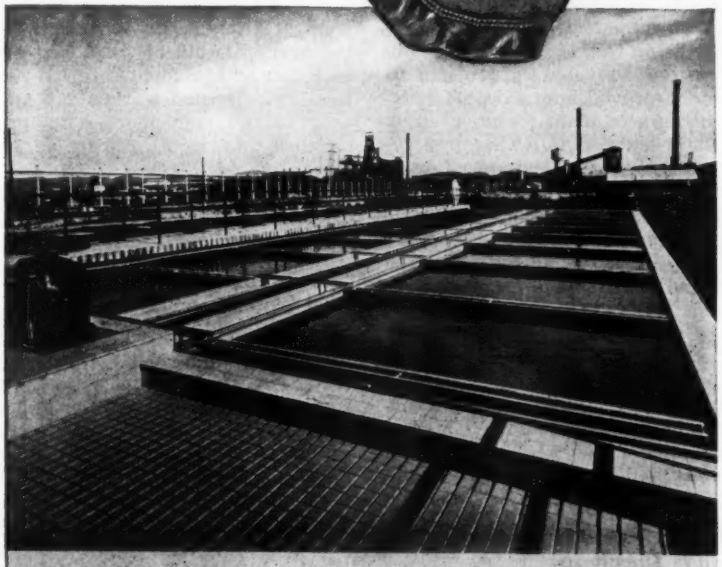
Philip N. Albright and A. B. Rich —"Six Conclusions from a Bacteriological Study of Swimming Pool Waters;" *Public Works*, June.

Water Turbines for New York's Water Supply

Between 30% and 40% of New York's water supply comes from the Croton river, which is impounded in 12 reservoirs and 6 controlled lakes. Only about a third of this can be distributed by gravity, the rest must be pumped. The capacity of the aqueducts and pumps is not sufficient to use all the Croton water during seasons of heavy run-off. The new Delaware aqueduct delivers water by gravity to the high level areas of the city, and crosses the Croton watershed near several of the reservoirs. One of the Croton reservoirs can discharge into the Delaware aqueduct by gravity, and it is planned to pump into this aqueduct from 50 to 112 mgd from other reservoirs which would otherwise go to waste. For this pumping, study was made of electric and of hydraulic pumping, the latter utilizing 104 ft. head and 123 ft. head between spillway and blowoff of two of the reservoirs. Hydraulic pumping would necessitate loss of the water used to operate the turbine, but there would be no cost for power. Study of curves of probable runoff indicated that hydraulically operated units would permit full utilization of all supply for about 65 yr.

Throw a wet blanket

HIGH COSTS!



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The Sludge Blanket in the Permutit Precipitator acts as a filter...SAVES YOUR EXPENSIVE CHEMICALS!

The positively agitated uniform sludge filter in the Permutit® Precipitator will save you up to 50% in space and 75% in time of treatment too!

The Permutit Precipitator offers you the newest and most efficient means of removing impurities from your water. It does this by precipitation, adsorption, settling, and upward filtration. Write for full details to the Permutit Company, Dept. PW-7, 330 West 42nd Street, New York 18, N. Y., or to the Permutit Company of Canada, Ltd., Montreal.

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WATER CONDITIONING HEADQUARTERS

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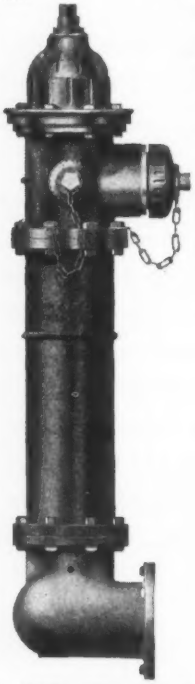
VALVES
and
WATER WORKS ACCESSORIES

A. W. W. A. type iron body, bronze mounted with double-disc parallel seat or solid wedge type. Non-rising stem, outside screw and yoke, or with sliding stem and lever. Also furnished hydraulically operated. Square bottom type operates in any position.



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ANNISTON, ALABAMA

out of a hundred, and the advantages of electric pumping would be limited to the remaining 35 yr.; only one year in six to any considerable advantage, and for 12 years out of the 100 to no advantage whatsoever. Even during years when the present Croton aqueduct and pumps could handle all the runoff, the operation of the hydraulic stations in place of pumping stations in the city would save enough in fuel and electric energy charges to pay for their original cost in about six to eight years.

Edward J. Clark—"Water Turbines to Pump Croton Supply into Delaware Aqueduct"; *Water Works Engineering*, May.

Method of Removing NCl_3

Brantford, Ontario, using free residual chlorination plus dechlorination by sulfur dioxide to 1 ppm free chlorine residual, suddenly found that objectionable amounts of NCl_3 were being formed. Removal of this by use of activated carbon and by aeration proved impracticable, partly because of plant features; either must be applied following free residual chlorination and prior to partial dechlorination with SO_2. A process found successful in producing a highly stable residual completely free of NCl_3 was as follows: Free residual chlorination, carrying with it the burden of NCl_3. Then complete dechlorination by SO_2 to zero chlorine residual reducing all NCl_3 to ammonia; the fortification of this ammonia by additional ammonia, and a postchlorination dose added to these ammonias.

D. B. Williams—"A New Method of Odor Control"; *Am. W. W. Ass'n Jour.*, May.

Sodium Silicate as Aid to Coagulation

The use of acid-treated sodium silicate as an aid to coagulation and filtration was developed in Chicago's experimental filtration plant and is used to great advantage in the New South District filtration plant. Its use in connection with aluminum sulfate greatly toughens the coagulation, permitting the use of coarser sand and faster filtration rates. For the old standard rate of 2 gpm per sq. ft. of filter can be substituted 3 gal. in designing filter plants; up to 4 or 5 gpm has been reached in Chicago. During the past winter the use of sodium silicate in the South District plant was started Dec. 28 and continued until about April 1. The amount used averaged about 6 lb. of SiO_2 per mg of water. At the price of 0.9 ct. per lb. for sodium silicate and the same for sulfuric acid, the cost was about 20 ct. per mg of water. The amount used never went above 10% of the weight of aluminum sulfate used, and the amount of the latter can be reduced, permitting a saving possibly as great as the cost of the sodium silicate treatment.

John R. Baylis—"Sodium Silicate Treatment at Chicago Filtration Plant"; *Water Works Engineering*, May.

Accident Prevention

With a view to prevention of accidents in the various public works departments of San Diego, Calif., an Accident Prevention Committee has been created, consisting of 25 operating superintendents and their assistants. As a result of its efforts, in the distribution division of the water department lost time injuries were 91% less in 1947 than in 1944; the average accident frequency was 95% less and accident severity 89% less. This division worked 170 men over 481,000 man-hours with only one lost-time injury during an 18-month period.

A. George Fish—"San Diego's Accident Prevention Program"; *Am. W. W. Ass'n Jour.*, May.

Cement-Coated Steel Water Conduit

In 1948, Syracuse, N. Y., laid 5,400 ft. of 48" steel pipe, which was coated on the outside with 1" of gunited cement mortar. After it had been laid, the inside was coated with cement mortar 3/16 inch thick by the Centriline process, which gave a continuous jointless lining. Cement was chosen instead of a wrapped tar coating because it was calculated to cost less and furnished additional structural strength.

Nelson Pitts—"New Conduit Lined Inside and Out;" *American City*, June.

Determination of Residual Chlorine

The determination of residual chlorine in water by amperometric titration with sodium arsenite in neutral solution has been proven to be the most accurate method available, and can be carried out by an apparatus which is fairly simple to construct, reasonable in cost, and which requires no calibration to use. This method eliminates interference due to substances which interfere with other methods used to determine residual chlorine in water.

W. A. Mahan—"Simplified Aero-

metric Titration Apparatus for Determining Residual Chlorine in Water"; *Water & Sewage Works*, May.

Chicago's South District filtration plant uses seven Wallace & Tiernan residual chlorine recorders, showing the residual chlorine at the entrances to the flocculators shortly after prechlorination, one in the settled water, two in the filtered water reservoirs and one of the water as it leaves the plant. Check tests are made hourly in the laboratory, using the W&T amperometric titrator, which gives free, combined, and total residuals.

H. H. Gerstein and John R. Baylis —"Chlorination at Chicago's South District Filtration Plant"; *Water & Sewage Works*, May.

Cross Connection Control at Houston

Houston, Tex., in 1930 passed a cross connection ordinance, and by Oct. 1, 1935, 211 cross connection surveys and 132 resurveys had been made, and 134 cross connections eliminated. During the next 13 years, 874 surveys were made, 658 resurveys, 219 cross connections were found, 215 were eliminated and the other 4 in the process of being. The control program consists of: 1—Surveys of building plans before construction is begun. 2—Preliminary surveys of new buildings under construction. 3—Resurveys of properties previously surveyed. 4—Surveys of properties outside the city limits. 5—Surveys of old buildings not previously surveyed.

Clyde R. Harvill, Charles Micha and W. J. Bale—"Cross Connection Control at Houston." *Am. W. W. Ass'n Jour.*, May.

Effect of Storage on Water Quality

Knoxville, Tenn., takes its supply three miles below the confluence of the Holston and French Broad rivers. Cherokee dam, 55 miles up stream on the Holston, and Douglas dam, 35 miles up stream on the French Broad, form two large multi-purpose reservoirs. Comparisons of the water at the mouths of these rivers for 5-yr. periods before and after these reservoirs went into service show differences in turbidity, color, alkalinity and pH. The temperature decreased from 63.4° to 59.3°, due to withdrawal of water through turbines from bottom strata. Turbidity dropped from 159 to 62 ppm, reducing alum consumption for coagulation. Color decreased from 22 to 14 ppm. Coliform organisms were 80% less most of the time. Average an-

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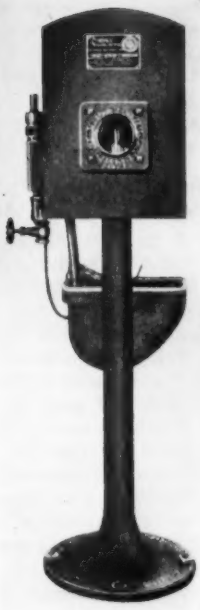

CHEMCO Type M-3
CHLORINATOR
CAPACITY RANGES
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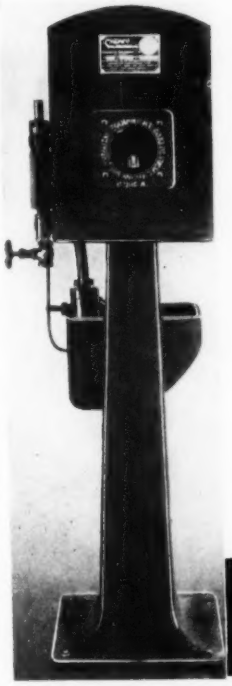
lbs. per 24 hours



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CHLORINATOR
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nual alum dosage decreased 11%, chlorine 44%, and total cost of chemicals, 18%.

F. W. Kittrell and John J. Quinn —"Multi-Purpose Reservoirs Aid Downstream Water Supply"; *Eng. News-Record*, May 26.

New Treatment Plant at Phoenix, Ariz.

A new 30 mgd water treatment plant at Phoenix which will be in full operation this summer is designed for maximum flexibility. Chemicals can be added to form a floc that will help to settle out 3,000 ppm suspended solids and partially remove 220 ppm hardness. Lime is fed through two gravimetric feeders of 1500 lb. per hr. capacity each. Activated carbon will be used when difficulty is encountered with algae. A novel feature is the use of ferric sulphate in liquid form produced at the plant by the autoxidation process, which has been used for a number of years at the Phoenix sewage treatment plant, and can be produced from scrap iron and sulfur for about $20 per ton as equivalent anhydrous ferric sulphate—about half the cost of the similar commercial product.

Leon W. Jackson—"Varied Chemical Dosage Easy in New Phoenix Water Plant"; *Eng. News-Record*, May 26.

Flow Tests Of Large Pipe Lines

Construction of a water supply project for Saginaw and Midland, Mich., recently placed in operation, included 48 miles of 48" prestressed reinforced concrete pipe, 32 miles of 36" prestressed concrete, and 10,400 ft. of 66" steel pipe with a spun coal tar enamel lining. Tests of the last at five different rates of flow, from 13 to 41.1 mgd, showed the Williams-Hazen coefficient to approximate closely to 130 throughout the entire range. Tests of the 48" prestressed concrete cylinder pipe showed an average C of approximately 145 for rates from 13 to 41 mgd. Tests of similar pipe 36" in diameter showed an average C of 140. Another line containing 71,000 ft. of 36" and 15,500 ft. of 24" showed a C for the composite line of between 140 and 150.

Louis R. Howson—"Saginaw-Midland Supply Project Begins Operations"; *Water Works Engineering*, May.

Dehumidifying Chicago's Filter Plant

At Chicago's South District filter plant a pilot plant is being operated to dehumidify a 234,000 cu. ft. pump room, whose concrete walls are surrounded by water tanks and where pipes and walls were formerly dripping wet. A 5,000 cfm dehydrating unit dries the pump room air by passing it through a spray of Kathene (a lithium chloride absorber) and discharges it into the pump room, maintaining positive pressure within the room to limit infiltration and moisture penetration through the walls. Dehydration started in January, when the relative humidity in the room was 85%. In two days this was reduced to 60% and became stabilized at 50%, and the pipes and walls have been kept entirely dry. The cost of the complete installation, including some new doors and walls, was $20,000.

M. B. Ashmore—"Chicago Dehumidifies Its Filter Plant"; *Eng. News-Record*, May 26.

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Intensive Aeration of Water. By *Nils K. G. Westberg*, Chf. Chemist, Stockholm, Sweden, water wks. May, Pp. 417-421.

Pipeline Network Flow Analysis Using Ordinary Algebra. By *Malcolm S. McIlroy*, Prof. of Elect. Eng., Cornell Univ. May, Pp. 422-428.

Maintenance and Operating Problems of Winnipeg. By *N. S. Bubbis*, Gen. Mgr., Greater Winnipeg Water Dist. May, Pp. 429-436.

Water Use by Air-Conditioning Equipment. By *Lewis L. Barnes*, Chf. Engr., Carrier Atlanta Corp. May, Pp. 437-440.

A New Method of Odor Control. By *D. B. Williams*, In Charge of Purif., Brantford, Ont., Water Works. May, Pp. 441-449.

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Taking of Pressures and Interpreting Results. By *S. D. Mitchell*. May 11, Pp. 11-15.

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Une Nouvelle Mesure de la Filtrabilite des Fluides. By *Percival Lionel Boucher*. May, Pp. 5-12.

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Principal Requirements of Cathodic Protection Systems. By *Frank E. Dolson*, Engr., St. Louis County Water Co. May, Pp. 175-176.

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Mechanization of Water Utility Operations. By *James G. Carns, Jr.*, Engr., Am. W. W. Co., and *W. D. Monie*, Asst. Mgr., Commonwealth Water Co. May, Pp. 178-181.

Tips on Backwashing of Ion Exchangers. By *Joseph Thompson* and *Francis X. McGarvey*, Resinous Prod. & Chem. Co. May, Pp. 182-183.

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Sodium Silicate Treatment at Chicago Filtration Plant. By *John R. Baylis*; Engr. of Purification. May, Pp. 404-407, 476.

Water Turbines to Pump Croton Supply into Delaware Aqueduct. By *Edward J. Clark*, Chf. Engr., Bureau of Water Supply, N. Y. C. May, Pp. 408-410, 478.

Higher Water Works Pay Needed to Attract Competent Men. May, Pp. 411-413, 480.

Saginaw-Midland Supply Project Begins Operations. By *Louis R. Howson*, Consult. Engr. May, Pp. 415-418, 476.

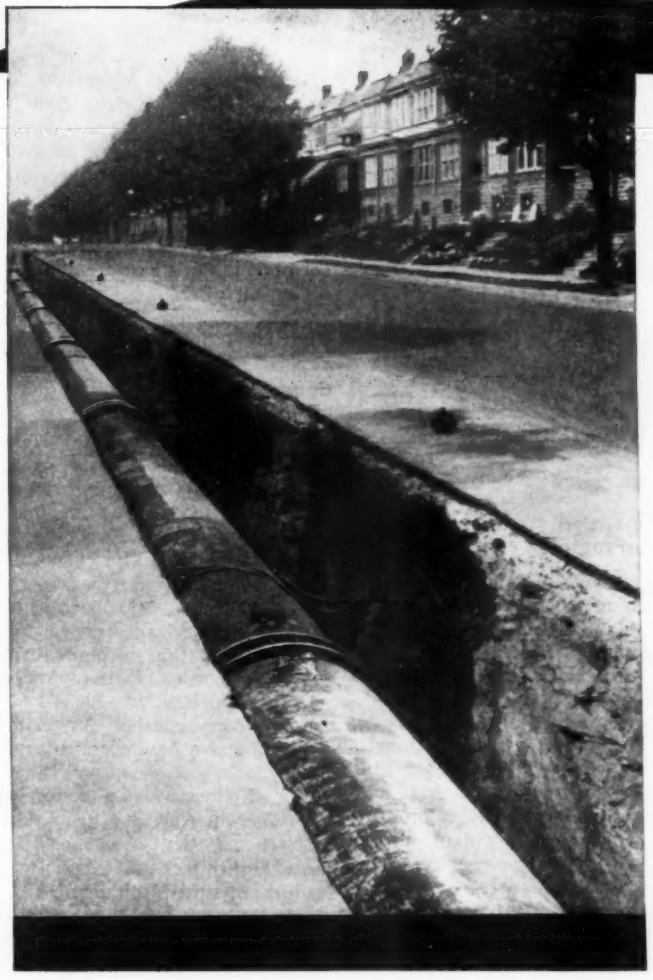
New York's Delaware Project Makes Notable Progress. By *Victor C. Brownson*, Dep. Chf. Engr., Bd. of Water Supply. May, Pp. 422-425, 466.

Safe Handling of Chlorine. By *Angus D. Henderson*, Engr., Dept. of Water Supply, New York. May, Pp. 452-453, 472.

Sewer Maintenance in San Francisco

The Bureau of Sewer Repair of San Francisco, which maintains the sewers of the city, during the latest fiscal year cleaned 10,476 catch basins by means of eductors, of which the bureau owns 12, removing 11,466 cu. yd. of silt at a cost of $99,251. It also cleaned 187 catch basins by hand, removing 155 cu. yd. of silt at a cost of $3,937. From the sewers themselves it removed 1,858 cu. yd., chiefly by use of a power-driven flexible rod, this work costing $64,873. Men, when working in the sewers, are equipped with a helmet with miner's electric lamp, the storage battery for which is carried by a belt; with a leather safety belt and rope; rubber boots; and a sack to protect the clothing.

IN PHILADELPHIA another coupled steel water line



The Godfrey Street water line, recently completed, is part of Philadelphia's extensive water works rehabilitation program. Like all the other steel lines laid since this program started, this 48″ and 42″ line is joined with Dresser Couplings.

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PUBLIC WORKS DIGESTS

THE HIGHWAY and Airport Digest

Prefabricated Tubes For Highway Tunnel

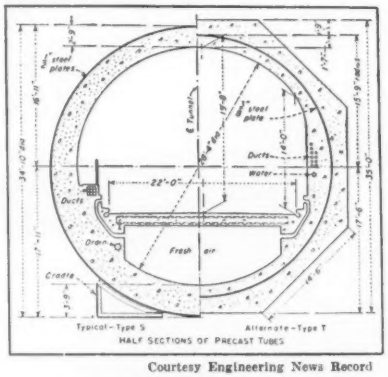
In relocating State highway 146 in Texas, a subaqueous tunnel under the Houston ship channel will be built to replace ferries. It will be 3,009 ft. long, 2,557 ft. of which will be precast tubes sunk in a dredged trench and 452 ft. of portals built cut and cover, the maximum depth below mean low water being 91 ft. The tube will be of circular interior cross-section 28'4" diameter with a 22 ft. roadway having a vertical clearance of 14' minimum and 19'8" maximum. The space under the floor will be used as a fresh air duct. Two types of construction are offered to bidders; one has the entire reinforced concrete tube surrounded by a shell of ½" steel plates 34'10" in diameter. The other will be reinforced concrete octagonal on the outside with a minimum diameter of 35'0", and containing a circular shell of ⅜" steel plates with a diameter of 31'6".

"Specify New Circular Tubes for Texas Highway Tunnel"; *Engineering News-Record*, May 19.

Weed Control In California

Los Angeles County, Calif., is crossed by 4483 miles of roads, mostly hard-surfaced. Over 900 men work the year around in maintaining them. This includes weed control, which is carried out during the rainy season by weed sterilization crews. Unless controlled, devil grass, puncture vine, dock, sweet anise and other weeds abound, sometimes growing so high as to obstruct the view. Hand treatment of 20 yr. ago gave place to mowing machines, and these are now being largely replaced by chemical control. For sweet anise and dock, 2,4-D is very effective, but for devil grass and puncture vine, ground sterilization is the only remedy. For this, they use a mixture of 200 lb. of sodium chlorate in 400 gal. of sodium metaborate solution, the latter to reduce the fire hazard of the former. This is applied by a sprinkler truck. A few years ago the weeds sometimes got out of control and were sprayed with diesel fuel and burned; but results with chemicals have proved so permanent that the sterilization crews now have the weeds well under control.

"Mushrooming County Has Roads to Match"; *Contractors and Engineers Monthly*, April.



Courtesy Engineering News Record

● ***TUBES for Texas highway tunnel.***

County-Operated Quarry is Profitable

White Co., Ark., had been hauling crushed stone for its roads from 60 miles away, at a cost of $3 per ton delivered on the road. Last May it installed a modern crushing plant in a quarry that had been abandoned for 80 yr. In 1948 this produced 24,000 cu. yd. of crushed stone at a cost of $1.50, selling some to the State Highway Dept. and to local contractors. By developing greater efficiency, the plant was producing 300 to 400 yd. per day of 1½" stone by December.

"County-Operated Quarry Cuts Maintenance Costs;" *Public Works*, June.

Highway Photography

The Missouri State Highway Dept. uses photography for many purposes, which can be classified under four major heads—for public relations purposes, legal work, engineering information, and motion pictures. Legal photographs may represent the difference between winning or losing a law suit. Engineering photographs include pavement and bridge failures, pieces of equipment, construction details, etc Motion pictures of work being performed permit comparison of methods used in different divisions and evolving of processes superior to those used in any one division, obtaining a higher quality of work at lower cost. These are used in instructing new men, and are shown to all the workmen for their pleasure as well as instruction. The author uses four cameras —a 5 x 7 view camera, a 4 x 5 press-type camera with synchronized flash, a 2¼ x 2¼ folding camera, and a 16 mm motion picture camera with 3-lens turret.

Walter H. Pohl—"Focusing on the Highway"; *Better Roads*, May.

Coarse Aggregate In the Netherlands

There is no rock in the Netherlands, and until 1936 all crushed stone for roads was imported from abroad. In 1936 was begun the crushing of gravel from the river Meuse. Much gravel for concrete had been dredged from this river but that over 6 cm had been thrown back. It is this larger gravel, up to 30 or 40 cm, that is being broken up for road work. Four plants have a total capacity of 500,000 tons, using a cone crusher for primary crushing and a hammermill for secondary.

"De Nederlandse Steenbrekerijen"; *Wegen*, April.

Snow Fighting Equipment and Methods

The experiences of western states last winter in fighting the worst blizzards since modern traffic came into being has led to some general conclusions relative to the most effective equipment and methods. Among these are the following: Highway departments cannot hope to equip for once-in-a-generation storms; but much wornout equipment should be retired and new purchased. The chief value of more equipment will be to open the roads

more quickly. Use bulldozers for "peeling" down packed drifts. More rotaries, the heaviest and most powerful models preferred. More all-wheel-drive trucks. Blade and V-plows are the backbone of the snow fleet. Motor grader-mounted V's and rotaries made a fine showing. Dozers and motor graders used in emergency storm areas should have cabs, even if only makeshift. Radio telephones proved priceless. Elevated windswept road grades, wide ditches and flat backslopes saved millions in plowing costs.

"Fighting Western Blizzards"; *Roads and Streets,* May.

Chemical Weed Killers

Engineers and other highway men, questioned on their ideas as to the efficiency of chemicals in eradicating roadside weeds, agree that the problem is far from being solved. Many believe that, while there is a future for chemical weed killers, results so far are too inconclusive to warrant wholesale spraying of roadsides. Among other opinions, one is that lespedezas and clovers, which are desirable on roadsides, are very susceptible to 2,4-D, and another that Kentucky bluegrass is killed by it. New Mexico, after trying 2,4-D last year, has returned to mowing as cheaper. Maryland considers use of chemicals undesirable because of the unsightly appearance of dead vegetation for long periods after each application, injury to growth outside the right-of-way, and depriving honeybees of food. Montana uses a sterilizing chemical around guard rails, guide posts and bridge ends, but finds it most economical to use a mower for general control.

"Will Chemicals Control the Weeds?"; *Better Roads,* May.

Turf Shoulders In New Jersey

Experience for two years by the New Jersey State Highway Dept. has shown that stabilized turf shoulders, if properly constructed, are safe for occasional traffic in all seasons of the year and improve the appearance of highways. A 3 ft. transition strip of bituminous concrete used as part of the 10-ft. shoulder eliminates wearing out of the turf next to the paved area and ruts next to the concrete slab. Heaving by frost is corrected by rolling with a 5-ton roller in the spring. The shoulder to be turfed is made with a 6" depth of a mixture of 3 parts 2½" stone or slag, 1½ parts sand and 2 parts soil. The stone prevents deep ruts. Bid prices for stabilized turf shoulders have run as low as $1.35 a sq. yd. Bituminous concrete shoulders with a 4" base course, a 3" intermediate course and a 1" top course cost $2.50 a sq. yd.

Oliver A. Deakin—"Stabilized Turf Parkway Shoulders"; *Better Roads,* May.

Seeding Roadside Shoulders and Slopes

In seeding 38,000 sq. yd. of shoulders and slopes on a 4-mile section of an Ohio highway, the ground was first covered with agricultural limestone at 100 lb. per 1,000 sq. ft., and 20 lb. per 1,000 sq. ft. of 10-6-4 fertilizer. A spike-tooth harrow then broke up the ground to a depth of about an inch. The following morning, grass seed was distributed at the rate of 4 lb. per 1,000 sq. ft. and the ground harrowed, and at once covered with a layer of straw mulch 2" thick, which was tied down with binder twine fastened to stakes driven at 4 ft. intervals in rows 4" to 18" apart. This mulch was left on until it was blown or rotted away, the grass growing up through it.

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Quicksand Slows Grading Project. April, Pp. 18-20.

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Stone for Pavement Produced by Crusher. April, Pp. 47-50.

New Concrete Slab Resurfaces Old One. By *W. F. Abercrombie*, Engr. of Materials, Georgia H'way Dept. April, Pp. 59-61.

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Economical Flexible Pavement Design. By *Norman W. McLeod*, Engr. Consultant, Dept. of Transport, Ottawa. May 12, Pp. 68-71; May 26, Pp. 49-53; June 9, Pp. 74-78.

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Statutory Authority of State Highway Departments in Municipalities. By *David R. Levin* and *Marion G. Markham*, Div. of Financial & Admin. Research, P.R.A. June, Pp. 161-183.

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Dirt Delivery Pays Cost of Cleaning Ditches. By *Everett Lanham*, Co. Surv. & H'way Supervisor. June, P. 23.

How We Get Wider Right-of-Way Without Cost. By *Edwin P. Knapp*, Co. Engr., Smith Co., Kans. June, Pp. 29-30.

Erratic Behavior of Piling in Mixed Sand and Clay Formation. By *R. M. Brown*, Res. Engr., Lake Co., Ill. H'way Dept. June, Pp. 32-33.

County-Operated Quarry Cuts Maintenance Costs. June, P. 74.

Getting Roads Ready for Winter. By *F. Ray Williams*, Co. H'way Supt., Saratoga Sp., N. Y. June, P. 75.

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Design for Railway and Vehicular Tunnel Under the Strait of Canso. May, Pp. 58-62, 94.

Stable Road Bases As Built in the County of Essex. By *W. H. Knister*, Road Supt. May, Pp. 64-65, 98.

Rigid Pavements for Highways and Airports. By *Theodore J. Kauer*, Wire Reinforcement Inst. May, Pp. 68-69, 101.

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More Speedy Road Jobs of '48. May, Pp. 45-47.

Job Studies Reveal Serious Equipment Delays. May, Pp. 51-52.

Road-Mixed Bituminous Mat Built with Two Stone Sizes. By *G. B. Major* and *E. H. Logan*, Div. Engrs., Missouri H'way Dept. May, Pp. 53-54.

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Highway Bridges. By *L. W. Jenkins*, Essex Co. Bridge Dept. May 13, Pp. 287-289.

Wegen (Holland)

Een Nederlandse Steenbrekerij. April, Pp. 85-95.

Cost of Meters in Detroit

The City of Detroit, Mich., set 11,514 water meters in the 1948 fiscal year, of which 10,318 were 5/8", 533 were 3/4", 342 were 1", and the remaining 321 were various sizes up to 8" compound. The average cost of installing the 3/8" meters was $11.78, of which $0.80 was for labor and cartage; the cost for 3/4" was $17.68, and for 1" was $24.38.

During the year, with 347,290 meters in service, 2,604 were repaired because of damage by frost, 7,216 because damaged by hot water, and 20,496 because of "wear and tear." The cost of repairing the first class averaged $3.36 for 5/8" meters, and up to $126.26 (mostly for material) for 3" meters. For repairing those damaged by hot water the cost averaged $3.71 for 5/8" meters, up to $17.06 for 2" meters. For meters damaged by wear and tear, the average cost of repairing 5/8" meters was $3.11, up to $11.88 for 6". The differences in cost were due largely to the costs for new materials, those for repairing "wear and tear" damages being much less than for the other two kinds in every size. The labor costs for 5/8", 3/4" and 1" averaged $2.24 per meter for frost damage and $2.28 for hot water damage.

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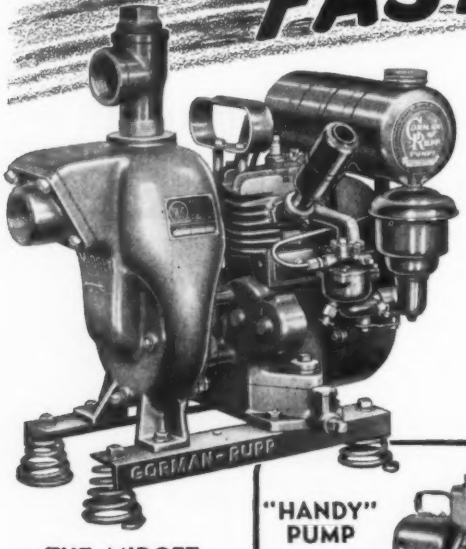

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Large photo above shows Dempster-Diggster loading crushed stone. Note how independent crowd and hoist action permits bucket to follow the slope of the material. At right, top: Digging out high bank. Right, center: Closeup of 1 cu. yd. (heaped) digging bucket. Right, bottom: Dumping crushed stone into truck.

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PUBLIC WORKS DIGESTS

SEWERAGE AND REFUSE DIGEST

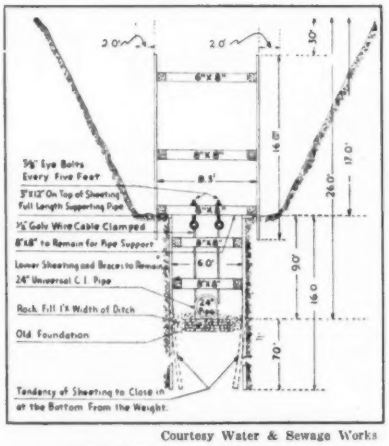
A Unique Sewerage Problem

Probably no other city in any country presents the sewerage problem found at Lima, Peru. The unusual feature is that there is absolutely no rain in the city; hence no need for storm sewers; hence also water for irrigation is scarce and valuable. Irrigation water is brought in from a distance and distributed by canals which pass through many of the streets. A municipal water supply also is piped in, and on leaving the houses was originally discharged into the canals, which thus became open sewers. Later, sewers were built here and there, most of them discharging into the drainage canals. The owners of farms and vegetable gardens claimed a legal right to the use of this polluted water for irrigation and resisted diversion of the sewage from the canals. Naturally the mortality from typhoid fever was high. In 1943 the Peruvian government created a committee to prepare plans for sewering the city, and the construction of the system it designed is now well under way. Provision is made for 250 liters per day per capita for the estimated population of 1985. This will be discharged through two ocean outfalls. Consideration was given to treating the sewage, chlorinating the effluent and using it for irrigation, and using the sludge as fertilizer; but it was estimated that it would be much cheaper to obtain an equivalent amount of irrigation water by pumping from wells.

Alfonso Pons Muzzo—"A Master Plan for the Enlargement of Metropolitan Lima's Sewerage System;" *Asociacion Interamericana de Ingenieria Sanitaria*, July.

Suspending Sewer Pipe in Trench

In 1928, Shreveport, La., laid a 24" sewer outfall in a trench 26 ft. deep in a soil formed by river deposit, much of it a fluid sandy silt. The pipe was laid on four layers of board, alternately longitudinal and cross-wise. This served well until some of the joints began to leak and liquid sand infiltered, causing cavities under the pipe and resulting settling of same. Finally 2300 ft. of this outfall was replaced, using Universal cast iron pipe, the joints of which could be made in running water. To insure against settlement, the pipes were suspended by ½" galvanized wire cable from 8"x8" beams placed across the trench and supported by sheeting 16 ft. long driven to a depth of 7 ft. below the sewer. The trench was excavated 12" below the sewer and this space filled with crushed stone, the voids in which became filled with sand. The cables and supporting beams and sheeting were left in place for the permanent support of the sewer.



Courtesy Water & Sewage Works

● ***SECTION through suspended sewer.***

Thos. L. Amiss—"Sewer Stabilization via Suspension;" *Water & Sewage Works*, May.

Percolation Rates in Sub-soil Disposal

In planning for sub-soil disposal of septic tank effluents, the common practice is to estimate the rate at which the soil will leach away the effluent by digging a hole in the soil, fill it 12" deep with water, note the time it takes for this water to disappear, then repeat the test. The authors consider this unreliable and recommend that the hole be filled 12" deep and the amount of fall of the water surface be measured at the end of 30-min. to 60-min., the hole then to be refilled at once to the 12" depth, and this be repeated until the rate of drop per interval becomes practically constant. If these rates be plotted against the elapsed times, the curve will approximate a hyperbola, the asymtote of which will be the permanent rate of absorption. Due to clogging which will be caused by suspended matter in the septic effluent, this rate should be multiplied by a factor, for which the authors suggest 5%.

Harvey F. Ludwig and Gordon W. Ludwig—"Improved Soil Percolation Test;" Water & *Sewage Works*, May.

Orlando's 8 MGD High-Rate Filter Plant

Orlando, Fla., is building a plant to treat its sewage, which it now discharges into the ground water through drainage wells. Sewage from six separate gravity systems will be collected by interceptors and brought to three pumping stations and by these delivered to a fourth or booster station, which will raise it to the treatment plant. The present population is 60,000 in summer and 90,000 in winter, and provision is made to treat 8 mgd sewage, and a maximum of 16 mgd. The plant is of the biofilter type, and will contain 2 primary tanks, 2 primary and 2 secondary filters and secondary settling tanks. Sludge from the secondary clarifiers is pumped to the inlet of the primary clarifiers. Primary sludge goes to 2 digesters with floating covers, the gas from which will drive a 180 hp gas-diesel engine. Drying beds will be provided with belt conveyors for removing the sludge to loading hoppers.

C. Wallace Smith—"Orlando Builds Biggest High-Rate Filter in the South;" *Public Works*, June.

Returning of Secondary Sludge

Wasting of excess activated sludge to the primary clarifier greatly reduces the volume of sludge to be digested, but it increases the solids

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content and oxygen demand of the settled sewage and thus increases the cost and difficulty of operating the activated sludge process. However, operators of activated sludge plants have no alternative but to use this method. The best possible results are obtained by wasting a little sludge every day instead of a lot on some days and none on others. The rate of wasting sludge to the primary basins should be as uniform as possible throughout the 24 hr. Carry an appreciable depth sludge (at least 2 ft.) in the primary sedimentation basins, and pump sludge from these basins to the digesters continuously or at frequent intervals.

In the case of an Imhoff tank, deliver the secondary sludge to the flowing-through compartment and not to the digestion compartment.

J. R. Haseltine—"Preconditioning and Digestion of Sewage Sludge;" *Water & Sewage Works*, May.

Sewer Joints by Machine Grouting

In *Sewerage Digest* for March, 1947, we described a method used at Tacoma, Wash., for jointing bell-and-spigot sewer pipes by injecting cement grout into the joint by machine, similar to guniting. Two years' experience there and in several other cities indicates that such machine-grouted joints are absolutely tight if ordinary care is used. A modified bell now is used in Tacoma, there being a small self-centering shoulder at the back of the bell to take the place of packing; and a 45° bevel around the inside edge of the bell provides enough additional annular space at the opening to admit the grout freely. A controversial point is the use of blocks 6" high under the pipe to provide space for machine-grouting the bottom of the joint, since it is impracticable to provide bell holes large enough for this purpose. But by carefully packing good back-fill material under the pipe, the objection to blocking seems to be eliminated.

C. S. Seabrook—"Machine-Grouted Sewer Pipe Joints;" *Engineering News-Record*, May 12.

Zinc Products From Pickle Liquors

A new company has been formed to treat the spent pickle liquors of the Wheatland (Penn.) Tube Co. and the Wheatland Steel Products Co. by reacting them with zinc by-products from the galvanizing departments to produce ferric hydrate and sulphate and chloride of zinc. Saleable materials will be made from spent acid liquors and zinc by-products. The ferric hydrate can be used in the manufacture of yellow and red iron oxide pigments or abrasives, or as a purifier for manufactured gas, in the preparation of ferric sulfate or ferric chloride for sewage treatment, or other ferric compounds. Markets for zinc sulfate include agricultural sprays, rayon manufacture, glue, electroplating, and others. Zinc chloride is used in fluxes, as a wood preservative, in vulcanized fiber manufacturing, paper finishing, glues and many other products.

"Zinc Products to be Made From Steel Plant Pickle Liquors;" *Sewage Works Engineering*, June.

Chlorinated Hydrocarbons for Controlling Sulfide Production

Both organic and inorganic sulfur compounds may serve as sources of energy for bacteria in the production of hydrogen sulfide. Chlorine is effective in controlling sulfides, but is used up too quickly and by too many side reactions. The ideal chemical for the inhibition of sulfide production in sewage is one

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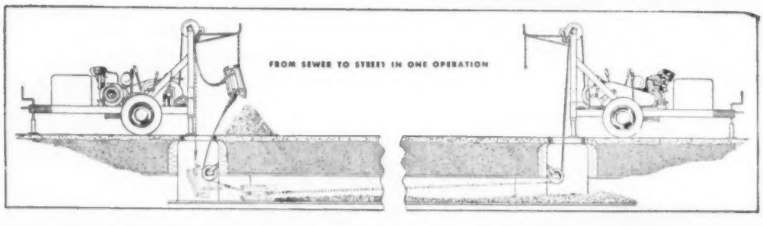

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that would be specific for the destruction of some phase of the respiratory processes of the sulfide-producing organisms. Experiences indicate that some of the chlorinated hydrocarbons and other organic chlorine compounds may possess the desired properties. Experiments indicate that chlorinated hydrocarbons such as orthodichlorobenzene, when properly emulsified, will inhibit the initial production of hydrogen sulfide in sewage, and thus keep the sewage in a relatively fresh state for a long enough time to permit passage through a sewer system. A 75% inhibition of sulfide production may be achieved for 18 hr. at 37° C in a normal domestic sewage when the chlorinated hydrocarbon emulsion known as Chloroben is present in a concentration of 1 ppm. Concentrations higher than this do not increase this effect to any appreciable extent. High concentrations of sulfate-reducing organisms and septic conditions nullify the inhibitory effect of chlorinated hydrocarbons in sewage and specific synthetic media. The mechanism of sulfide production by the decomposition of sulfur-containing organic compounds by normal sewage organisms, such as those of the coliform group, can be controlled by the addition of small dosages of chlorinated hydrocarbons; but reduction of mineral sulfates cannot be so controlled and must be controlled by removal of the *Sporovibrio desulfuricans* sources, such as sewer slimes.

Rolf Eliassen, Austin N. Heller and Gerhard Kisch—"The Effect of Chlorinated Hydrocarbons on Hydrogen Sulfide Production;" *Sewage Works Journal*, May.

Maintenance of Milwaukee's Sewers

The Bureau of Sewers of Milwaukee, Wis., is organized into a construction, an engineering, an accounting, and a maintenance division.

Construction crews excavate for catch basins, construct storm inlets and build short sections of new sewers. Each crew has a combination tool wagon and shanty; an air compressor and 3 jackhammers, 2 clay diggers and a demolition tool; a 1½" centrifugal pump; screw jacks; 200 ft. of 2½" hose and 100 ft. of 1" hose; a hydrant valve, and miscellaneous tools. A truck-mounted Hydro-crane is used for digging, at a cost 30% less than hand digging.

There are 4 sewer cleaning crews of 3 men each, using a pair of champion 7.5 hp. machines, 2 pairs of Turbine 7.5 hp. machines and one pair of 3 hp. Turbine; with 6" to 18"

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self-closing buckets. Catch basins are cleaned by two crews, each using 3 or 4 eductors, and a 1½-ton truck and small centrifugal pump for cleaning basins that cannot be cleaned properly by eductors.

There are two sewer inspection crews of 3 trained men, which inspect structural conditions of the sewers, amount of flow, depth of deposit, etc.; examine all contract work upon completion; check for high-water marks in manholes after storms. Each crew has a safety belt, rubber coats, hats and boots and rubber suits; a Wolff safety lamp, aluminum ladders, and small tools.

The total budget for operation and repairs for 1948 was $523,459, approximately $480 per mile.

Lloyd D. Knapp—"Sewer System Operation and Maintenance Procedures at Milwaukee;" *Sewage Works Journal*, May.

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Electric Crane Reduces Waiting Time on Sewer Tunneling Job. By *L. T. Bruhnke*. June, P. 31.
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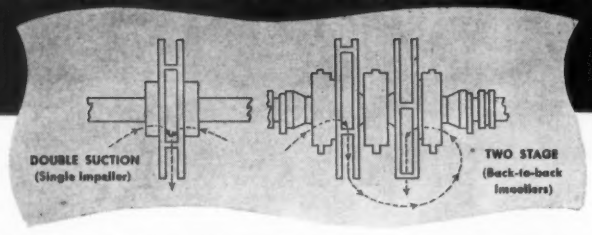

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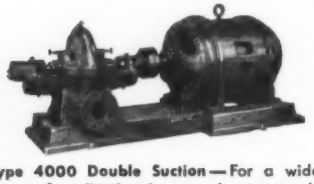

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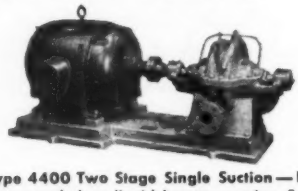

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Making Traffic Surveys

(Continued from page 24)

observers do their work correctly, and to observe the time intervals established for the station count.

(2) On a day prior to the count, the captains should be assembled to receive instructions on how to organize their stations and use the forms. The captains should make practice counts at an intersection with the type forms to be used at their intersection. They should be closely checked to see that all procedures are understood. At this time each captain will receive his packet for his station, check its contents, and be advised on any special problems that might be found at his station.

(3) Station captains should be furnished with written instructions for reference in case of doubt.

6. *Making the Count.* (1) Observers should be at their stations at least 15 minutes before the actual count begins. This will enable the station captain to pass out materials, instruct his observers, and run a brief test count.

(2) Each station captain must have a watch for checking time intervals. It is suggested that kitchen "minute minders" be used by the captains for determining time intervals.

(3) There should be one adult supervisor with a car for each six to ten stations. The supervisors should visit all stations as soon as possible at the beginning of the count to check on personnel and give aid when necessary. Supervisors should make periodic checks throughout the day not only to check the work but take care of any needs of the observers.

(4) Adequate relief should be provided the observers. The best method is to assign shifts of observers for two or three-hour periods. Relief shifts should arrive at their stations about ten minutes in advance of relief time to be briefed by the observers on duty. Another method is to use a double shift. Both shifts are present at the station for the whole period of the count with one shift counting for a half hour and the other shift takes over for a half hour. However, double shifts may lead to too much playing and be distracting to the observers on duty.

(5) At the end of the actual count, the station captain gathers the sheets from the observers, sees that they are in order, replaces them in the packet and turns them in as directed.

(6) Traffic counts should be made only on a fair day. Rain, snow, or heavy fog affects the amount and character of traffic. Plans should be made in advance as to what to do in case of adverse weather.

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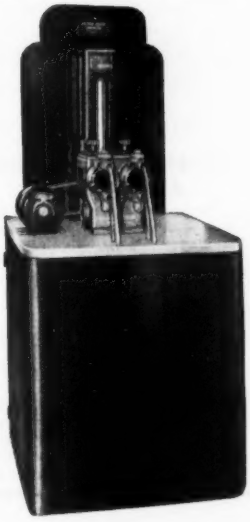

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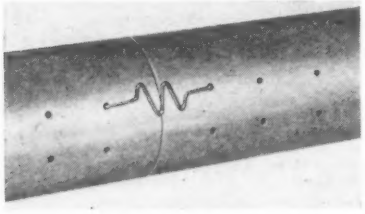
The Best Joint for Drain Pipe

Made of No. 0 spring wire, this spring clip joint slips into the perforations of vitrified clay drain pipe and holds adjacent sections into



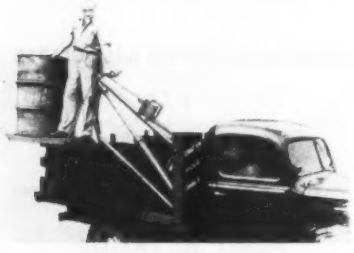
Simple drain pipe jointer.

true line and grade. Two clips are normally used per joint, but 3 can be used. The clip is now available for 4", 6" and 8" pipe and will soon be available for larger sizes. Bell and collar depressions are eliminated, as are "pulled" joints. For information, write Bowerston Shale Co., Bowerston, Ohio.

Use coupon on page 65; circle No. 7-1

Hydro-Loader and Hydro-Crane for Better Use of Trucks

The hydro-loader is attached to the side of the truck and folds against the outside, out of the way, when not in use. Operated by a



How the loader works.

power take-off, it handles all kinds of material. The hydraulic crane fits into the floor of the truck; it is made in 1-ton and 2-ton ratings. Fine for handling all heavy material, as pipe, hydrants, big valves, etc. Very handy for water, street and sewer departments. Stratton Equipment Co., Cleveland, Ohio.

Use coupon on page 65; circle No. 7-2

Permanent Aluminum Street Signs

These signs are cast of corrosion-resistant aluminum, which is ductile and permits straightening. The finish is of the newest plastic acid and alkali proof coatings, with a choice of color combinations. Installation is made quickly with stainless steel bands. Visibility is unusually good.

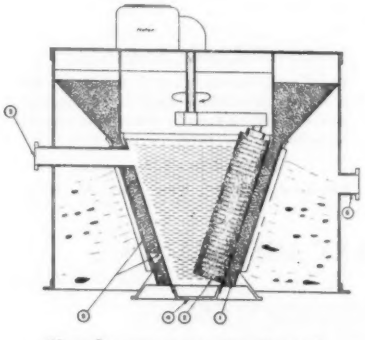
How an aluminum sign looks.

Many other types of markers are also available. Send for folder. Lake Shore Markers, 654 West 19th St., Erie, Pa.

Use coupon on page 65; circle No. 7-3

Sewage Treatment by Filtration and Incineration

This is the newest method of sewage treatment. It consists of a cone filter 8 ft. in diameter by 8 ft. high, through which the sewage passes. Filter plates and a coke filter remove the solids, and nylon brushes keep the filter clean. The filtered sewage can be chlorinated; the sol-



Simple sewage treatment.

ids are burned in a special mobile or stationary incinerator, using oil for fuel. These treatment units are specially designed for installation on sewer outfalls in order to prevent or reduce stream pollution. They are odorless, noiseless and low in cost. The incinerator units will burn material containing up to 90% moisture. Charging is by hoist bucket from the street level. Full data on both the filter unit and the incinerator can be obtained from Nepeco, Inc., 899 Boylston St., Boston, Mass.

Use coupon on page 65; circle No. 7-4

A Packer-Type Rubbish Collector

Engineered for shorter wheel-base trucks, this unit operates equally well on loose garbage, boxes and cans, general refuse, and even ashes.

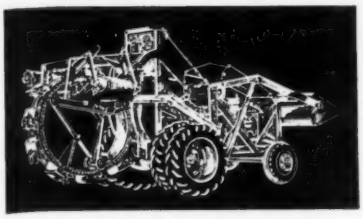
Woodson 12-yd. garbage body.

Capacity is 12-cu. yd.; loading height is very low; the bucket dumps into the top of the body and cannot be jammed, according to the manufacturer. The unit is especially suited to use in congested areas and in narrow alleys. A bulletin is available from Woodson Products, 4200 E. Nevada, Detroit 12, Mich.

Use coupon on page 65; circle No. 7-5

A Highly Useful Trencher for Sewage and Water

This trencher is mounted on a Case wheel tractor. It will cut to 48" deep and from 12" to 18" wide, and within 30" of curbs and foundations. An angledozer and other equipment can be mounted on the



Trencher, shovel and angledozer.

same tractor unit, so that it can backfill its own trenches. For digging, there are sixteen forward digging combinations of speed. The front-mounted loader can handle the surplus dirt into trucks. This is one of the "companion tools" manufactured by the Construction Products Corp., 410 San Fernando Road, Los Angeles 31, Calif.

Use coupon on page 65; circle No. 7-6

Makes Floating of Concrete Fast and Easy

These vibrating units eliminate the hard work of hand floating dry concrete and speed up the work about five times. They are particularly advantageous with very low moisture concrete. The float is made

Syntron concrete floater.

in two sizes; a pulsating electro magnet is the vibrator; intensity of vibration can be controlled by a handy switch, to permit most effective work according to the material and the stage of the finishing process. In the illustration, a unit is being used for finishing a floor and it will be noted that it spreads the concrete as well as finishes it. It is entirely suitable for concrete and mastic floors, sidewalks, streets, driveways, etc. Full data from Syntron Co., 660 Lexington Ave., Homer City, Pa.

Use coupon on page 65; circle No. 7-7

New GMC Heavy Duty Trucks Announced

A complete line of heavy duty trucks, including 61 basic gasoline and diesel models, has been announced by GMC Truck & Coach Division of General Motors Corp. These models will range, in gross vehicle weights, from 19,000 to 75,000 pounds, and are in addition to the GMC line of light and medium duty trucks. The new trucks will be on exhibit at GMC truck dealers early in the summer—possibly before this is published.

Use coupon on page 65; circle No. 7-8

Pipe Saw Cuts Cast Iron or Steel Pipe Quickly

This air-powered pipe saw cuts cast iron or steel pipe from 12" to 48" diameter at the rate of 2" per minute. Edges are clean cut; an air pressure of only 85 pounds is required. The cut is made in one complete rotation of the saw. Cuts above ground are made by rolling the pipe onto skids; in trenches, only 14" clearance is required. It can cut pipe under water. Full data from E. H. Wachs Co., 1525 N. Dayton St., Chicago 22, Ill.

Use coupon on page 65; circle No. 7-9

FWD Multiple Purpose Maintainer

The well-known FWD "HG" truck has been redesigned as a multiple-purpose road maintainer, with such auxiliary equipment as an underbody blade, a front-end blade, a weed cutter, a road roller, a special road oiling body, a sand spread-

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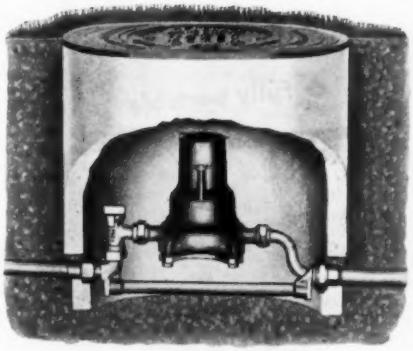

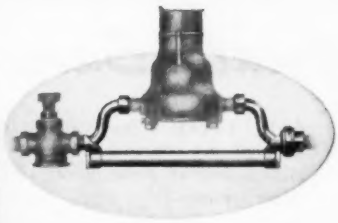

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er, a post hole digger and a flame thrower. Drills, tampers, saws, wrenches, breakers and sprayers can be operated off the air compression equipment. If you want to find out what this unit cannot do, write Four Wheel Drive Auto Co., Clintonville, Wisc.

Use coupon on page 65; circle No. 7-10

A "Packaged" 60-cfm Compressor

This is a complete and ready-to-operate airpower plant, 2-stage, 60 cfm, v-belt drive, air-cooled compressor and 15 hp motor, mounted on an 8.5-cu. ft. air receiver with base and all electrical controls.

Jaeger 60 compressor.

Maximum working pressure is 125 lbs. Ask for Bulletin JCS-8, Jaeger Machine Co., Columbus 16, Ohio.

Use coupon on page 65; circle No. 7-11

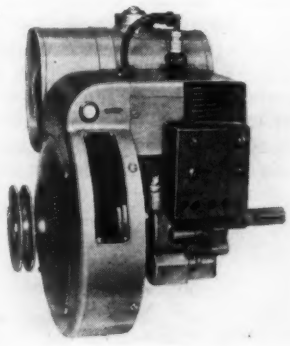
Taking High Cost and Hard Work Out of Materials Handling

This is a new power wheelbarrow, called the Moto-Bug. It has a 4-hp. engine and a 10-cu. ft. or 1,200-pound capacity. Speeds 2 to 4 mph, both ways. Photographs, schematic diagrams and specifications in a new catalog. Kwik-Mix Co., Port Washington, Wisconsin.

Use coupon on page 65; circle No. 7-12

19-Pound Engine Develops 4 HP

The new No. 20 engine is 2-cycle, and uses die-cast aluminum for all major castings. Of unusual simplicity,



Homelite 4-hp. engine

the engine will operate in either horizontal or vertical position. 4 hp at 4000 rpm; 3 hp at 3000 rpm. It is 9½"x11½"x13". Homelite Corp., Port Chester, N. Y.

Use coupon on page 65; circle No. 7-13

A Spray Nozzle for Trickling Filters

The Morris spray nozzle is designed for use with trickling filters. It provides a wide, fine spray, insures a minimum of clogging, and is easy to clean. It is simple to instal and service. It is not necessary to take a nozzle apart for cleaning. *Berks Engineering Co., 6th & Chestnut Sts., Reading, Pa.*

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Removing Expansion Joints Quickly

This machine provides a fast and sure method of removing old asphalt expansion joints in streets, highways and airports. Various widths of joints are provided for by exchangeable cutters. Counter-clockwise motion of the cutter tends to pull the machine ahead, helping the operator. On some jobs, as much as 1500 ft. of expansion joint per hour has been removed. For full data write *San Jose Pipe & Tank Co., 1596 West San Carlos St., San Jose, Calif.*

Use coupon on page 65; circle No 7-15

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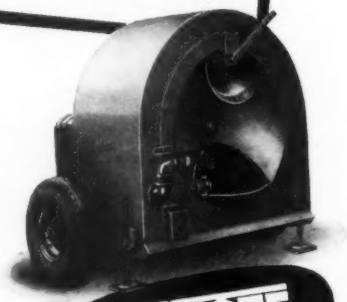
Ask for bulletin K-100.



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Annual Public Works Congress and Show

Long range planning of public works will be one of the major topics of discussion at the 55th Annual Public Works Congress and Equipment Show, which will be held at Kansas City, Mo., Sept. 18 to 21. An entire afternoon will be devoted to an "equipment clinic" at which special demonstrations will be put on by manufacturers.

The technical session on refuse collection and disposal will be headed by Warren Coolidge, director of Public Works of Nashville, Tenn., with Ralph Taylor of Cincinnati, Henry W. Taylor of New York and R. A. Williams of Miami, Fla., participating. Other subjects that will be covered include traffic safety; organization, personnel and public relations for a public works department; street maintenance; street cleaning and snow removal; motor equipment; and street layout and construction.

NEWS OF ENGINEERS

Russell L. Johnson of Link-Belt Co., Philadelphia, has received his C.E. degree from Rutgers University. His thesis was based on a study of mixing equipment for water and industrial waste treatment. Mr. Johnson served in the Asiatic Theater with the Sanitary Corps.

Robert N. Clark has been promoted to the grade of Colonel in the Reserve Corps. At present he is chief sanitary engineer for the Tennessee Valley Authority with headquarters in Chattanooga.

Albright & Friel Move Offices

Albright & Friel, Inc., consulting engineers, have moved to 121 South Broad St., Philadelphia 7, Pa., effective July 2. The changes of offices was made to provide larger quarters.

BOOKLETS AND CATALOGS

These are available from the publisher or by using coupon on page 65.

Diesel Engines. — The most educational and artistic booklet that we have ever seen. Transparent pages with cutout show the step-by-step process of stripping an engine down to its fundamentals and show precisely what the interiors look like and how they work. This is an inadequate description, but the best we can do. Better see for yourself. Fairbanks-Morse & Co., Chicago 5, Ill.

Water Measuring Equipment.—Bulletin 310, R. W. Sparling, Box 3277, Terminal Annex, Los Angeles, Calif., shows typical meter locations, pressure loss curves, specifications, minimum and ideal flow ranges and prices on equipment.

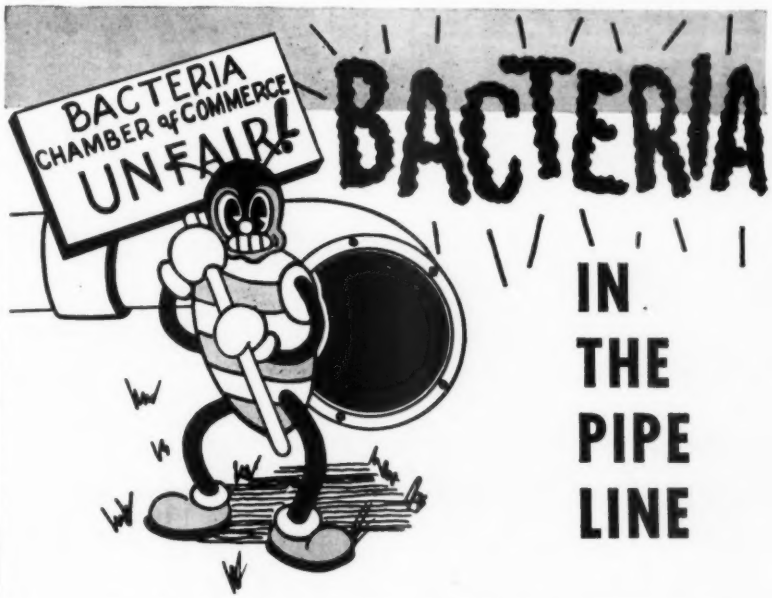
Blowers, Fans & Exhausters: This 16-page catalog describes a large variety of turbo blowers, exhausters, high temperature fans, rotary positive blowers, ventilators, etc., and gives specifications. General Blower Co., Morton Grove, Ill.

Snow Loader.—An 8-page bulletin describes utility and heavy-duty snow loaders and shows how they can be used economically for other work during no-snow seasons. N. P. Nelson Iron Works, Inc., Clifton, N. J.

One-half Yard Power Shovel: This 4-page folder describes the new ½-yard Michigan power shovels, four types of which are available. These have either single or twin engines and are available in 2 or 4-wheel drive. Michigan Power Shovel Co., Benton Harbor, Mich.

Modern Snow Removal.—This is an 8-page folder based on a 15-minute 16mm sound and color movie, "Modern Snow Removal by Haiss." Emphasizes the performance of the snow loader. Costs of hand and machine removal are compared. Movie is also available. George Haiss Mfg. Co., Park Ave. & 141st St., New York 51, N. Y.

Flanged Piping: "Taylor Forge Stainless" is the title of a 4-page folder with drawings, dimensions and prices of new type fittings and flanges in stainless steel. Taylor Forge & Pipe Works, P.O. Box 485, Chicago 90, Ill.



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★ ★ INDEX OF ADVERTISEMENTS ★ ★

Albright & Friel, Inc. 58
All Purpose Spreader Co. 49
Alvord, Burdick & Howson 58
American Public Works Assn. 37
American Well Works 56
Atlas Mineral Prod. Co. 63
Ayer-McCarel-Reagan Clay Co. 18

Baker, Jr., Michael 58
Banister Engineering Co. 58
Barker & Wheeler 58
Black & Veatch 58
Bogert Assoc., Clinton L. 58
Bowe, Albertson Assoc. 58
Bowerston Shale Co. 18
Bowser, Inc. 64
Brown Engineering Co. 58
Buck, Seifert & Jost 58
Builders-Providence, Inc. 36
Burns & MacDonnell Eng. Co. 58

Caird, James M. 58
Capitol Engineering Corp. 58
Centriline Corp. 16
Chemical Equipment Co. 45
Chester Engineers 58
Chicago Bridge & Iron Co. 6
Chicago Pump Co. 3
Coff, L. 58
Cole & Son, Chas. W. 58
Conseer, Townsend & Assoc. 58
Corson, Oscar 58

DeLeuw, Cather & Co. 58
Dempster Brothers, Inc. 51
Dickey Clay Mfg. Co., W. S. 18
Dolge Co., C. B. 67
Dorr Co., The 35
Dow, A. W., Inc. 58
Dresser Mfg. Div. 47

Flexible Sewer Rod Equipment Co. 54
Foote Co., Inc., The 62
Ford Meter Box Co. 61
Ford Motor Co. 2
Frink Sno Plows, Inc. 66

Gannett, Fleming, Corddry & Carpenter, Inc. 58
Giant Mfg. Co. 64
Gilbert Associates, Inc. 58
Goff, William A., Inc. 58
Goldak Co. 66
Gorman Rupp Co. 50
Greeley & Hansen 58
Green Co., Howard R. 59

Harte Co., John J. 59
Hellige, Inc. 70
Heltzel Steel Form & Iron Co. 12
Hill & Hill 59
Hitchcock & Estabrook, Inc. 59
Hotel Raleigh 68
Hydraulic Development Corp. 62

Inertol Co., Inc. 40
International Harvester Co. 4
Irving Subway Grating Co. 70
Irvington Form & Tank Corp. 13

Jaeger Machine Co. 41
Johns-Manville 15
Jones, Henry & Schoonmaker 59

Kennedy, Clyde C. 59
Knowles, Inc., Morris 59
Koch & Fowler 59

Layne & Bowler, Inc. 8
Lewis, Harold M. 59
Link-Belt Company 10 & 11
Lock Joint Pipe Co. 71
Lozier & Co., Wm. S. 59

McCray Co., F. G. 59
McCulloch Motors Corp. 17
McWane Cast Iron Pipe 64
Metcalf & Eddy 59
M & H Valve & Fittings Co. 44
Moore & Owen 59
Murdock Mfg. & Supply Co. 70

National Clay Pipe Mfrs., Inc. 53
National Fireproofing Corp. 18
National Water Main Cleaning Co. 38

Pacific Flush Tank Co. 66
Palmer & Baker, Inc. 59
Peerless Pump Division 69
Permutit Co. 43
Phelps, Inc., Boyd E. 59
Pirnie Engineers, Malcolm 59
Pitometer Company 59
Pomona Terra-Cotta Co. 18
Pressure Concrete Co. 68
Proportioneers, Inc. 57

Quinn Wire & Iron Works 66

Robert & Co., Inc. 59
Roberts Filter Mfg. Co. 67
Roots Connersville Blower Corp. 55
Russell & Axon, Cons. Engrs. 59

Skinner Co., M. B. 67
Smith & Gillespie 59
Stanley Engineering Co. 59
Stilson & Assoc., Alden E. 59
Superior Engine Division 9

Taylor, Henry W. 59
Texas Vitrified Pipe Co. 18
Trickling Filter Floor Institute 18

Wallace & Tiernan Co., Inc. Back Cover
Wayer Impactor Sales Co. 41
Wertz & Assoc, Emerson D. 59
Wood Co., R. D. 39
Worthington Pump & Machinery Corp. 14

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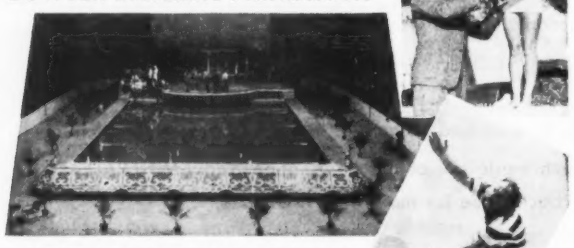

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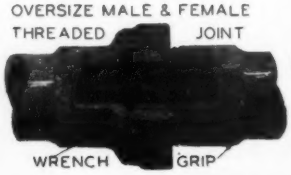

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Improved Clarification with Carter Circular Collectors

61. Latest 16-page bulletin on water and sewage equipment, No. 4906, gives complete data and specifications on Carter's three different types of clarifiers. A valuable working guide for every sanitary engineer. Ralph B. Carter Co., Dept. PW, 192 Atlantic Ave., Hackensack, N. J.

Engineering Facts About Transite Pipe

83. This compilation of Johns-Manville's "Engineering Facts" series presents concise, factual information about Transite's many economic and engineering advantages, and includes informative case histories plus dimensions and data for your files. Write Johns-Manville, Box 290, New York 16, N. Y., or use the handy coupon.

Complete Fire Fighting Equipment Bulletin

92. Everything from helmets to hydrants is listed in the 100-page bulletin on "Fire Fighting Equipment" recently published by Darley. Over 500 different items for fire department and other city agencies described and prices listed. Ask for Bulletin 139. W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill.

Handbook for Care of Centrifugal Pumps

127. Every owner of a centrifugal pump should have a copy of this excellent handbook which is packed with sound information on ways to make your pump last longer and give better service. The workings of centrifugal pumps and effects of pump abuse are cleverly illustrated. Data in this helpful booklet applies to all makes of pumps. Published by Allis-Chalmers Mfg. Co., Dept. PW, Milwaukee, Wisc.

How to Save Labor and Avoid an Unpleasant Job

128. Information on the new Worthington Comminutor is now available in Bulletin W-2010-B3, which describes the modern method of automatically shredding sewage solids. Includes specifications and data on this new unit which is readily installed in straight rectangular channels. Write Worthington Pump & Mach'y Corp., Dept. PW, Harrison, N. J.

Data on Chlorinizer Now Available

132. Bulletin 840-F2 features the Builders Chlorinizer and shows complete details of apparatus to accurately meter chlorine gas and deliver controlled chlorine-water solution. Positive rate of flow indication, wide metering range. Get your copy of this bulletin from Builders-Providence, Inc., 16 Codding St., Providence 1, R. I.

Newly Designed Watersphere—the Modern Elevated Tank

146. A handsome leaflet describes the newly redesigned Watersphere, built in capacities from 25,000 to 250,000 gals., 50 to 125 ft. to bottom. Sphere is supported on a single, gracefully curved column. Be sure to investigate this tank of pleasant appearance and modern welded construction. Data from Chicago Bridge & Iron Co., 2115 McCormick Bldg., Chicago 4, Ill.

Helpful Book Gives Pipe Flow

159. This handy 40-page pocket size book titled "Measurement of Water Flow Through Pipe Orifice with Free Discharge" explains the Layne pipe orifice meter method of computing water flow. Includes flow graphs for various size pipes. Layne & Bowler, Inc., Box 215, Hollywood Station, Memphis 8, Tenn.

Using Sewage Sludge Gas for Power Generation

160. The Fairbanks-Morse Diesel and Dual Fuel Engine, Model 31A can operate on either sludge gas or oil to supply steady power output despite fluctuations in gas production. Detailed spread shows passage of fuel, air, oil and water on cutaway section. Get Bulletin 3100 AG31 from Fairbanks, Morse & Co., 600 So. Michigan Ave., Chicago 5, Ill.

Seven Advantages of Sanitary Land Fills

161. Development of sanitary fills to lower sanitation costs and steps for the proper operation of these fills are described in bulletin 12314 titled "Lowering Health and Sanitation Costs" and issued by Caterpillar Tractor Co., Peoria 8, Ill.

Modern Sweeper Speeds Street Cleaning

162. The Austin-Western Model 40 sweeper features three wheel design, front wheel steer, for easy maneuvering; rear broom to sweep dirt and refuse directly into 2-yd. hopper; built-in flushing device. Diagrams showing all operations and full specifications in Bulletin AD-2042, issued by Austin-Western Co., Aurora, Ill.

CONSTRUCTION EQUIPMENT

Your Tractor Converted To Front End Loader

24. Need a front end bucket loader that can be converted into a light plow or grader in a matter of minutes? Write for this folder that illustrates, describes and gives specifications of the Ottawa Industrial Front End Loader for industrial tractors. Loads earth, sand, gravel and other bulk material. Quick change over can be made to light bulldozer, V-type snow plow, grader or maintainer with attachments. Write Dept. PW, Ottawa Steel Products, Inc., Ottawa, Kans.

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50. Don't take more time to move your loader to the job than to do the work. Investigate the Eagle Truck Mounted Loader for handling gravel, sand, cinders, snow from windrows or piles. Get forms 444 and 947 from Eagle Crusher Co., Inc., Galion, Ohio.

Data and Pictures of Complete Line of New Ford Trucks

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22	23	24	25	27	31	33	34	35	41	42	45
46	47	48	49	50	52	53	58	60	61	64	65
69	71	72	73	74	80	82	83	84	85	86	87
90	92	93	94	99	101	102	103	106	107	108	109
110	111	112	114	116	117	119	122	124	126	127	128
129	130	132	133	135	136	138	144	146	148	157	158
159	160	161	162	163							

New Products, Pages 60-62:

	7-1	7-2	7-3	7-4	7-5	7-6	7-7	7-8
7-9	7-10	7-11	7-12	7-13	7-14	7-15		

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74. This 32-page catalog lists a full line of compressors built in the sizes needed to operate efficiently modern air tools. Write for Catalog JC-8. Jaeger Machine Co., Columbus 16, Ohio.

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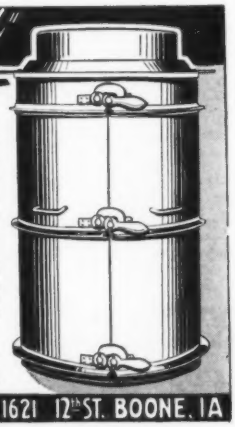

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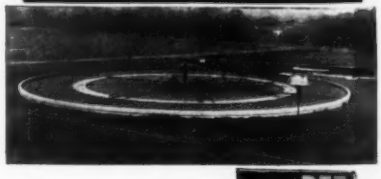

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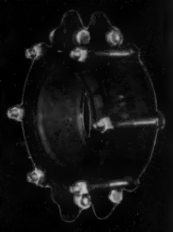

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71. pH and Chlorine Control. A discussion of pH control and description of comparators, chlorimeters and similar devices. An 88 page booklet. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

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73. Engineering data on parabolic flumes and accurate companion meters for open flow water and sewage metering is given in Simplex bulletin 210. Installation data and calibration included. Write Simplex Valve and Meter Co., Dept. 4, 6750 Upland St., Philadelphia 42, Pa.

Job Data Offered on New Steel Water Lines

80. An 8-page illustrated report listing pipe diameters, pipe wall thicknesses, line pressures, coatings, engineering personnel, etc., is entitled "A Report of Dresser-Coupled Steel Water Lines in the Year 1947." A copy will be sent by Dresser Mfg. Div., 59 Fisher Ave., Bradford, Pa.

How to Estimate Quantity Of Joint Compound Needed

87. The uses of Tegul-Mineralead for bell and spigot pipe and G-K Sewer joint compound are described in bulletins issued by Atlas Mineral Products Co., Mertztown, Pa. Includes useful tables for estimating quantities needed.

Tested Jointing Materials

102. "Hydrotite" is a self-caulking, self-sealing joint compound for bell and spigot pipes. For data book and sample write Hydraulic Development Corp., 50 Church St., New York, N. Y.

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103. Automatic Filter Operation. The Robotrol automatically back washes, rewashes and returns the filter to service. Illustrated Engineering Bulletin 1230. Infilco, Inc., 325 W. 25th Place, Chicago 16, Ill.

Pressure Pipe That Retains Capacity

106. Several bulletins describing the construction of pressure pipe, list of installations, carrying capacity tests, making service connections under pressure; and detail descriptions of several installations. Lock Joint Pipe Co., Box 269, East Orange, N. J.

Full Data on Method and Results Of Water Main Cleaning

107. Water main cleaning by the National Method is title of 4-page folder describing methods and results obtained, with full data. National Water Main Cleaning Co., 30 Church St., New York 7, N. Y.

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108. Centrifugal Pumps of various designs—single-stage, double-suction, split casing; single-stage single-suction; two-stage opposed impeller; three-stage; high-pressure; fire pumps; close-coupled. A bulletin for each type. Write to Dept. P.W., Peerless Pump Div., Food Machinery and Chemical Corp., 301 W. Ave. 26, Los Angeles 31, Calif.

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109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa.

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WESTPORT, CONNECTICUT

"GUNITE"

Sewage Disposal Plant and Sewer Repairs The Sure Way!

Restore your facilities at minimum cost in the shortest time with the best material.

Write for our 48 page illustrated "Gunite" Bulletin— "It Tells You How."

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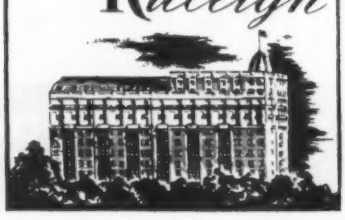


Do You Ever Have Leaks to Fix?

124. You'll want to know about the full line of "Skinner-Seal" clamps for repairing bell and socket joint leaks and broken mains. Step-by-step procedures are illustrated in catalog 41, a handsome 40-page presentation which shows applications of all fittings. Write M. B. Skinner Co., Dept PW, South Bend 21, Ind.

The Modern Way to Filter Swimming Pool Water

129. That's the title of a bulletin full of facts about Bowsers' new diatomite filter to produce clear, sparkling, clean water at low cost. Occupies small space, doesn't waste water. Gives sizes to use, performance charts, etc. Write Bowser, Inc., Dept. PW, 1395 Creighton Ave., Ft. Wayne, Ind.

All About Cement-Mortar Lining of Water Mains

133. Here, in a really beautiful booklet, is practically everything you need to know about this method of lining mains in place—the needs, methods, and results that will interest you. Centriline Corp., Dept. PW, 140 Cedar St., New York 6, N. Y.

Here's Data on All Swimming Pool Needs

135. Well illustrated bulletin describes filters, water softeners, hydrogen ion plants, chlorine feeders and complete equipment for swimming pools, etc. Copy sent on request by Dept. PW, Chemical Equipment Co., 223 Center St., Los Angeles 54, Calif.

Paint for Protection And Good Appearance

144. An 8-page bulletin describes 14 different uses for "Inertol" products in water works for protecting and waterproofing concrete, steel and wood structures. Get data on these paints and enamels from Inertol Co., Inc., 470 Frelinghuysen Ave., Newark 5, N. J.

Faster Pipe Laying With Precaulked and Threaded Joints

148. McWane 2" cast iron water pipe with threaded joints and precaulked bell and spigot pipe are described in folder WM-47. Additional data on 3" to 12" centrifugally cast pipe and fittings in folder WL-47, both issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala.

Complete Equipment for The Complete Pool

157. Latest equipment for recirculation, filtration, chlorination, softening and pH control are described in Permutit Bulletin No. 2157. Manual and automatic valves explained and many installations diagrammed. Complete specifications given. Permutit Co., 330 West 42nd St., New York 18, N. Y.

POWER AND LIGHT

Dual Fuel Engines for Municipal Power

27. A new 8-page illustrated bulletin, No. 4811, describes Superior Dual Fuel Diesel engine operation and illustrates the simplicity of controls with fuel conversion by either push buttons or hand lever. Copies are available from Superior Engine Div., Dept. PW, The National Supply Co., Springfield, Ohio.

STREETS AND HIGHWAYS

Strong, Speedy, Low-Cost Maintainer Has Many Uses

22. BG Maintainer, a powerful speedy, low-priced machine for light road maintenance. Full details in illustrated folder. Huber Mfg. Co., Dept. PW., Marion, Ohio.

Data on All Types of Bins and Batching Plants

47. Good illustrations and useful data on all types of Heltzel Highway Bins, for truck mixer charging, bulk cement plants, enclosed bucket elevators, belt conveyors, etc. Heltzel Steel Form & Iron Co., Dept. PW, Warren, O.

Speed Your Work With These Powerful Motor Graders

48. Two powerful Galion motor graders designed to answer every requirement for more speed in road, airport, dam and housing construction work are fully described in a folder illustrated with many action pictures. Issued by Galion Iron Works & Mfg. Co., Galion, Ohio.

Latest Maintenance Equipment For Blacktop Roads

52. "Blacktop Road Maintenance and Construction Equipment"—Asphalt and tar kettles, flue type kettles, spray attachments, tool heaters, surface heaters, road brooms and rollers. This is modern and up-to-date equipment for blacktop airport and road construction and maintenance. Write for Catalog R. Littleford Bros., Inc., 452 East Pearl St., Cincinnati 2, Ohio.

Open Steel Mesh Pavement for Bridges

72. A pavement that is self-cleaning, self-draining, light of weight, strong, durable, fireproof, economical and requires no maintenance, is described in a 24-page catalog by Irving Subway Grating Co., 5053 27th St., Long Island City 1, N. Y.

Improved Special Rollers Help Cities and Counties

84. Road and street widening are speeded up with Buffalo-Springfield trench rollers of improved design. Many other special compacting problems handled by the portable KT-6 model. Get engineering specifications in bulletins TR-3B and KT-6 from Buffalo-Springfield Roller Co., Springfield, Ohio.

How to Beat the Weed Problem

85. Be sure to investigate weed control with selective chemical weed killers. Ask for bulletins on Dolge products that will rid roadsides, parks and lawns of the weed nuisance. C. B. Dolge Co., Dept. PW, Westport, Conn.

Just Right for Fast, Small Asphalt Mixes

90. The Foote Kinetic Mixer delivers 3 cu. ft. in 30 seconds. Portable and easily operated. Get Bulletin K-100 from The Foote Co., 1954 State St., Nunda, N. Y.

Light Weight Machine Does Work of Heavy Roller

111. For compacting hot or cold patching material be sure to investigate the Wayer Impactor, 2,000 blows per minute tamps, finishes and cures. All data in Bulletin 25-8. Wayer Impactor Sales Co., 12 N. Third St., Columbus 15, Ohio.

Fast, Efficient Skid-Proofing

114. Get full facts about Baughman Light-Weight Cinder Spreaders, fast operators for cinders, sand, salt, chips, etc. Free flowing at low temperatures. 9-17 cu. yd. capacity. Write Baughman Mfg. Co., Dept. PW, Jerseyville, Ill.

How to Speed Curb and Gutter Work

126. Here's a 24-page bulletin illustrating form set-ups for every type of curb and gutter work. Send for Bulletin 2259 and learn how to speed up the job with Blaw-Knox Steel Street Forms. Write Blaw-Knox, Dept. PW, Farmers Bank Bldg., Pittsburgh 22, Pa.

Adhesive Joint Sealers and How They Are Applied

130. Learn how joints are prepared and Flintseal Hot-Poured Joint-Sealing compound applied. Series of pictures shows each step and explains every operation for good joint construction. On request from The Flintkote Co., Dept. PW, 30 Rockefeller Plaza, New York 20, N. Y.

Uniform Spreading 2 to 10 ft. Wide

136. Saves labor, spreads 0 to 100 lbs. a sq. yd., dusts up to 1" material forward, reverse, on curves, hills or straightaway. Assures uniform, even density of spread. Write for bulletin: Dept. PW, All Purpose Spreader Co., Fuller Road, Elyria, Ohio.

When you need special information—consult the READERS' SERVICE DEPT. *on pages 65-69*

Investigate the Profit System Of Trenching, Grading, Loading

163. A complete line of accessories is available to convert a wheel tractor to a trencher, front end loader, grader, angle dozer, earth auger or many other types of machinery, needed in every municipality. Get data on the Profit System Champion Tools fully described in Bulletin 121. Write Construction Products Corp., Dept. PW, 4345 East Imperial Hwy., Lynwood, Calif.

SEWERAGE AND REFUSE

How You Can Clean Sewers From Streets Easily and Inexpensively

23. 32-page illustrated booklet explains how a city can clean its sewers and culverts with its own forces using the up-to-date Flexible Sewer Rod equipment. Illustrates and describes all necessary equipment. Issued by Flexible Sewer Rod Equipment Co., 9059 Venice Boulevard, Los Angeles 34, Calif.

Sanivan Features Faster Refuse Loading, Greater Capacity

31. Compression loading plate on the Sicard Sanivan crushes ordinary loose garbage into ⅛ original space. For clear, cutaway views of this positive compression action and mechanical full discharge get the "Sanivan" bulletin. Write Sicard Industries, Inc., 2055 Bennett Ave., Montreal 4, Canada.

New Unit Cleans Catch Basins in a Jiffy

34. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit. Netco Div., Clark-Wilcox Co., 118 Western Ave., Boston 34, Mass.

Packaged Sewage Treatment— Just Right for Small Places

36. "Packaged" Sewage Treatment Plants specifically developed for small communities — 100 to 3,000 population. Write for full description and actual operating data for this type of plant. Chicago Pump Co., 2348 Wolfram St., Chicago 18, Ill.

Design Details for Sludge Collectors

42. Booklet No. P.W. 1742 on Link-Belt Circuline Collectors contains sanitary engineering data and design details. Catalog No. 1742 on Straightline Collectors, contains layout drawings, illustration pictures and capacity tables. Address Link-Belt Co., 2045 West Hunting Park Ave., Philadelphia 40, Pa.

Furnace Data on Low Cost Incineration

49. The new furnace data bulletin issued by Nye gives information on six furnace sizes which may be used in single or multiple units, plus details of special features. Use coupon or write Nye Odorless Incinerator Co., 51 East 42nd St., New York 17, N. Y.

Vitrified, Salt Glazed Filter Bed Block

86. An 8-page folder contains instructive design applications and detailed descriptions of Dickey underdrain tile for filter bed bottoms. Diagrams show how air passes up through blocks for filter ventilation. Issued by W. S. Dickey Clay Mfg. Co., 922 Walnut St., Kansas City 6, Mo.

Useful Design Data on Sedimentation Tanks

99. "Sedimentation with Dorr Clarifiers" is a complete 36-page illustrated catalog with useful design data. Ask The Dorr Company, Dept. P.W., 570 Lexington Ave., New York 22, N. Y.

Do You Have the Best Possible Sludge Conditioning?

110. "Ferri-Floc," description and instructions for use in coagulation, sludge conditioning and treating industrial wastes, fully treated in a 24-page pamphlet. Tennessee Corp., 619-27 Grant Bldg., Atlanta 1, Ga.

Be Sure to Check These Digester Features

117. Floating covers for digesters, their advantages and details of construction, and suggestions for digester operation are contained in a 42-page catalog. Write Pacific Flush-Tank Co., Dept. PW, 4241 Ravenswood Ave., Chicago 13, Ill.

Get This Data for Your Laboratory

119. "Water and Sewage Analysis," a 32-page booklet, describes and illustrates equipment for making convenient and accurate water and sewage analyses, including comparators, aqua testers and turbidimeters. Hellige, Inc., 3718 Northern Blvd., Long Island City 1, N. Y.

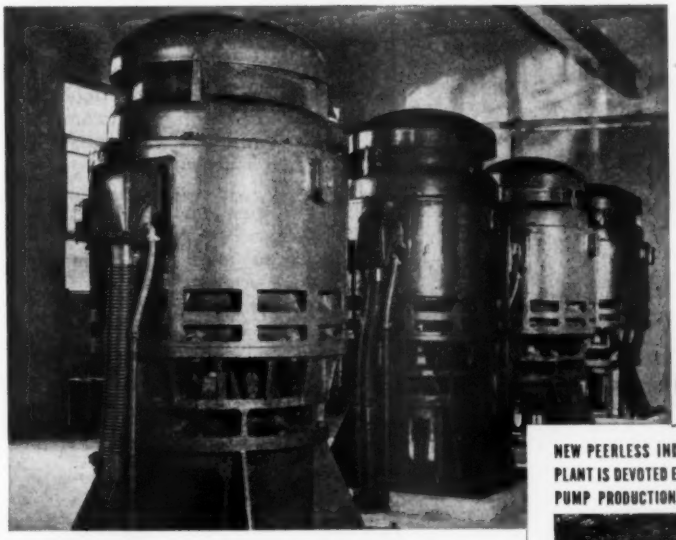
Need Low-Cost Air For Sewage Treatment?

122. New 20-page booklet shows operating and construction features of Rotary Positive Blowers engineered to fit your needs. Air for activated sludge, water treatment; constant vacuum for filtering. Bulletin 22-23-B-13 gives details. Roots-Connersville Blower Corp., 712 Poplar Ave., Connersville, Ind.

How to Make Sewage Plant Grit Suitable for Fill, Roadways

138. The Jeffrey "Jigrit" washer does a thorough job of scrubbing grit free of organic solids. Grit is classified according to size and organics rejected with overflow. 44-page Catalog 775A describes the "Jigrit" and gives engineering data and installation views of grit and sludge collectors, chemical feeders, garbage grinders and other equipment as well. Dept. PW, Jeffrey Mfg. Co., 948 N. Fourth St., Columbus 16, Ohio.

PEERLESS VERTICAL TURBINE PUMPS



fmc PEERLESS PUMPS

NEW PEERLESS INDIANAPOLIS PLANT IS DEVOTED ENTIRELY TO PUMP PRODUCTION & SERVICE

Here is one of America's newest pump plants—19 acres of modern manufacturing facilities devoted to precision production of horizontal and vertical pumps, located at Indianapolis. Plan with Peerless for pumps plus fast, complete pump service.

CUT OVERHEAD Underground

For your next job consider the flexibility and the efficiency of the Peerless vertical turbine pump.

As a deep well pump, for example, a Peerless pump can assure you of an independent source of clean water from your own well —water that will be of constant temperature, of constant chemical analysis. To cut overhead underground, Peerless turbine pumps embody many exclusive engineering advantages, such as patented Double Bearing-Double Seal bowl construction, all contributing to their extended trouble-free pumping life.

As another example, a Peerless vertical turbine pump utilized as a close-coupled pump, assures you of full turbine pump utility and capacity from short or medium settings. They're ideally suited for installation over pits, sumps or basins or for pumping water from surface sources. The 4 pumps shown above are indicative of this type of service. You can easily visualize their application to condenser cooling, cooling tower service, etc.

Regardless of your requirements, a versatile Peerless vertical turbine pump will squarely meet your pumping demands. Peerless offers widest capacity range, from 15 to 30,000 gpm against heads to 1000 feet. You can have your choice of oil lubricated or water lubricated types and a choice of power drive, direct-connected electric, right angle gear, V or flat belt or combination drives Write for individual Bulletins describing the applications of Peerless pumps to these services.

PEERLESS PUMP DIVISION
FOOD MACHINERY AND CHEMICAL CORPORATION
Los Angeles 31, California Indianapolis, Indiana
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IRVING DECKING

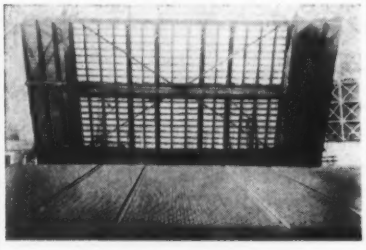
the ORIGINAL
open steel grid

Assures:

- LONG LIFE
- LOWEST MAINTENANCE
- UNINTERRUPTED SERVICE
- MINIMUM DEADLOAD
- INCOMBUSTIBILITY
- GREATEST SAFETY
- PERMANENT TRACTION
- INWROUGHT SMOOTHNESS
- SELF-DRAINAGE
- CLEANEST SURFACE

Irving Decking on Vertical Lift Span

Irving Decking on Fixed Span



Irving Decking on Bascule Span

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WORTH TELLING

A former highly successful short story writer, but for the past 12 years advertising manager of Public Works, Arthur Akers makes his bow as our newest columnist. We think that his will be a real contribution in readability, interest and liveliness. His own apologia follows.—W. A. Hardenbergh.

By Arthur K. Akers

For a long time it has been felt at PUBLIC WORKS that that unsung Atlas, the manufacturer — who makes good products and good magazines possible—is entitled to a place all his own in the magazine. So with this issue we initiate a column where the manufacturer comes first, with the accent on the personal rather than the products side.

●

Customers of the **Ford Meter Box Company** of Wabash, Indiana, are due for some pleasant surprises, according to a warning just issued by **John Ford.** Pending a new price sheet in their forthcoming catalog No. 50, items bought at a price are apt in some cases to be billed at a lower one. And we don't know anybody who is going to get mad about that!

●

Indefatigible **Nelson Thompson,** vice-president of **Homelite Corporation,** Port Chester, N. Y., announces the opening of their new Pittsburgh office at 810 Ridge Avenue in charge of **William ("Bud") Livingston,** whose likeness here is to be identified with Homelite's new sales, stocks, and service branch.

"Bud" Livingston

●

Builders Iron Foundry, Providence, R. I., best known in this field through its associated companies, Builders-Providence, Inc., % Proportioneers, Inc. %, and Omega Machine Company, announces promotion of Vice-President **Earl H. Bradley** to executive vice-president, and **Irving O. Miner,** formerly chief engineer, to vice-president.

●

Neptune Meter Company's Chicago office will now be located at 4048 West Taylor Street. The move is to provide more space for laboratory and service facilities following Neptune's acquisition of **Rensselaer Valve Company,** according to President **John H. Ballantine.**

GET BEHIND IT

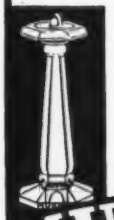
Readers of P. W. would prove public benefactors to an even greater degree if they were to get behind a program of favoring the installation of additional drinking fountains at transfer points, public buildings and corners where crowds collect and on neighborhood playgrounds.

Each drink from a MURDOCK Outdoor Drinking Fountain is fresh from the water main. Pedal operated. Self-draining.

"It Pays to Buy MURDOCK"

The Murdock Mfg. & Supply Co.

Cincinnati 2, Ohio



MURDOCK

"LOCK-LID" STREET WASHERS 1/4" and 1" SIZES
SELF-CLOSING ANTI-FREEZING HYDRANT
ANTI-FREEZING COMPRESSION HYDRANT
LARGE ANTI-FREEZING HYDRANTS 1½" TO 2" INCLUSIVE

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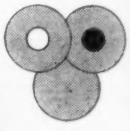
TURBIDIMETER

A TURBIDIMETER WITHOUT STANDARDS

Accurate • Foolproof • Universal



Also MEASUREMENT OF TURBIDITY (SiO_2) DETERMINATION OF SULFATE (SO_4) AND OTHER APPLICATIONS

WRITE FOR CATALOG No. 8000

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